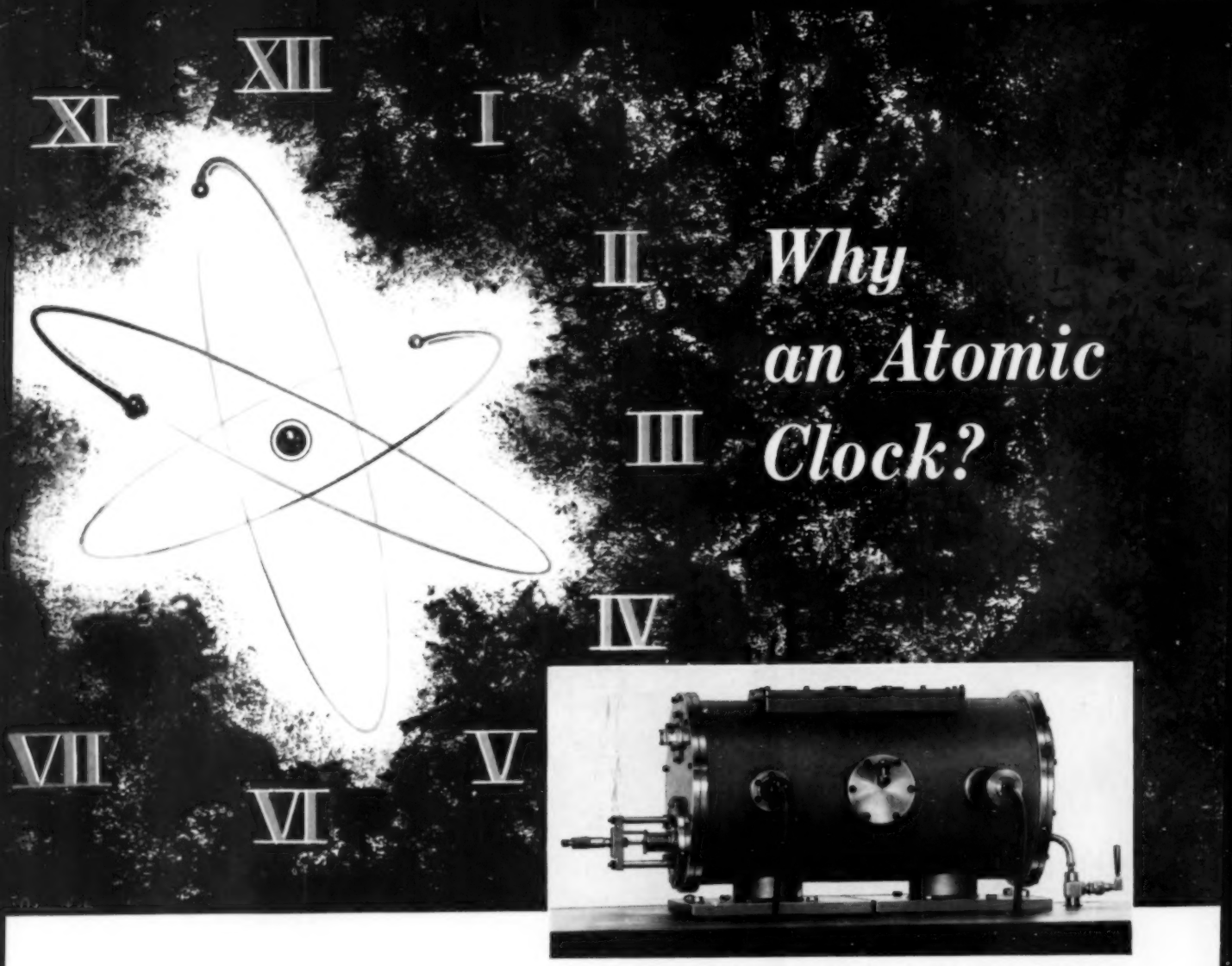
March, 1957

Price, $1.00

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

The Shop Teachers' Professional Magazine

SCHOOL SHOP ANNUAL



Why an Atomic Clock?

Photograph Courtesy of Jet Propulsion Laboratory, California Institute of Technology.

Scientists at Columbia University have developed an atomic clock. This clock, known as the "maser" (short for Microwave Amplifier by Stimulated Emission of Radiation), produces a 24,000,000,000 cycles per second signal directly from the molecular energy of the ammonia molecule. The maser will be an invaluable tool in the hands of research engineers and scientists who are exploring such fields as radio communications, microwave transmission and reception, and molecular and atomic structure. The atomic clock is another means of furthering man's quest for knowledge of his universe and of life itself.

The modern educator in many ways works like the scientist. Constantly searching for new techniques, new tools, new "masers" to assist him in the education of our future generations. Instructors of mechanical drafting look upon precision drawing instruments much in the same light as the scientist accepts the maser. Certainly a cheaper set could be used by the student to execute his elementary drafting problems, but the completed problem is not the significant lesson of mechanical drafting. Precision drawing instruments foster a boy's first love for precision workmanship. Precision drawing instruments inspire creative thinking and generate a pride of self-accomplishment. Worthy instructors recognize drawing instruments in their true perspective and insist their students obtain the finest set they can afford.

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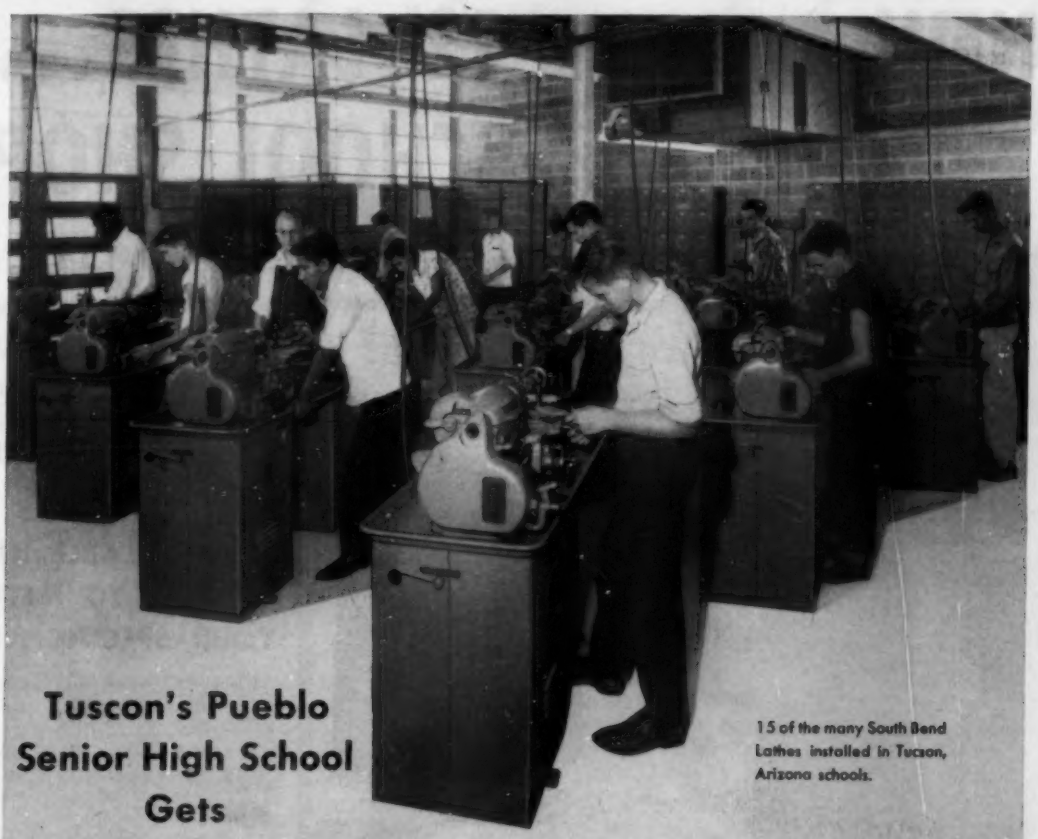

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15 of the many South Bend Lathes installed in Tucson, Arizona schools.

ALL ESSENTIAL BIG LATHE FEATURES

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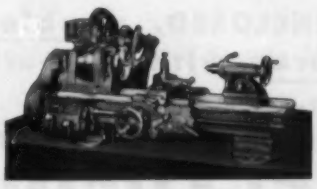
Tucson's school system is but one of many that can offer more adequate training because of the big lathe features of South Bend Lathes. This is important as it better equips students to step into industrial jobs. On even the smallest South Bend Lathes they learn the operation of gear boxes, power feed aprons, threading feeds and speed changes that won't have to be re-learned on the job. Also, there is a greater possibility of their working on a South Bend Lathe because they are widely used throughout industry.

You will also find that South Bends make machine handling easier to learn and give long service that is virtually free of maintenance. You'll find them to be one of the best choices you have ever made. Write now for complete information.

Light Ten Precision Engine Lathe with Metal Column Base. Prices start at $666.

"How To Run A Lathe" the original and most popular handbook on the operation and care of lathes, shop practices, etc. Invaluable to students. 128 pages. 50c—free sample to shop teachers.



Light Ten Precision Bench Lathe. Prices start at $369.

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MARCH
1957

VOL. 46 NO. 3

Industrial Arts and Vocational Education

The Shop Teachers' Professional Magazine

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☆ ☆ ☆

This Month's Cover

This month's cover picture shows a student at work in the arc-welding department at Bok Vocational-Technical School, Philadelphia, Pa.

The photograph was submitted by Benjamin J. Novak, vice-principal of Frankford High School; and lecturer in vocational education at Temple University, Philadelphia.

☆ ☆ ☆

March Is Red Cross Month

"On the job — when it counts," is the slogan for the 1957 Red Cross Campaign, with "Join and Serve" as the campaign theme. Particular emphasis will be placed this year on Red Cross aid to disaster victims, assistance to servicemen, veterans, and their families, the blood program, and health and safety programs.

When you join Red Cross, you help its workers to carry on their work of being good neighbors.

☆ ☆ ☆

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Articles Indexed. — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."

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Association News

KANSAS CITY PLANS 1957 AIAA CONVENTION

Delegates to the 19th Annual Convention of the American Industrial Arts Association will face the problems of "Developments Affecting Industrial Arts Education Programs" when they meet at Kansas City, April 23–26.

Meeting just before the general sessions of the AIAA will be the allied associations: The American Council on Industrial Arts Teacher Education with Dr. R. Lee Hornbake, director of industrial education, University of Maryland, in charge; and the American Council of Industrial Arts Supervisors led by G. Wesley Ketcham, consultant in industrial arts for the Connecticut State Department of Education. These two associations will meet on Tuesday and Wednesday, April 23 and 24.

AIAA President, Roy A. Radtke, director of industrial arts, Milwaukee Public Schools, will open the general convention on April 24 in a program featuring Dr. Lindley Stiles, dean of the School of Education, University of Wisconsin, who will keynote the convention with his discussion of "Developments Affecting Education of America."

Other industrial-arts leaders who will speak at the major sessions include Dr. John A. Fuzak, co-ordinator of industrial arts, Michigan State University; and Dr. H. H. London, professor of industrial education at the University of Missouri.

Gardner Boyd, supervisor of industrial arts, Kansas City Public Schools, is the general chairman of the Convention Committee.

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Better Machine Tools for Teaching
. . . safer to operate, easy to learn on

For every school shop, laboratory and classroom . . . (from beginning classes in industrial arts and vocational education through advanced courses in trade schools and universities) . . . Sheldon builds a lathe to fit each academic, space and budget requirement.

Sheldon lathes are modern in design. With their easy-to-operate controls, students can learn basic lathe operations quickly and rapidly advance to practical shop projects.

From the largest 15" swing geared head lathe to the smallest 10" swing bench lathe, every Sheldon-built lathe meets the same rigid standards . . . standards that insure long life with minimum maintenance requirements in your school shop.

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13" Swing
Precision Lathe

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10" Precision Lathe

Sheldon-Built
Sebastian 13" and 15" Geared Head
Precision Lathes

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COMING CONVENTIONS

Mar. 14–16. New Jersey Vocational and Arts Association, at Berkeley Carteret Hotel, Asbury Park, N. J. Secretary, Richard O. Harthmann, 63 Lexington Ave., Jersey City, N. J.

Mar. 21–23. Ohio Industrial Arts Association, at Neil House Hotel, Columbus, Ohio. Secretary, C. R. Hawes, 629 Sweitzer St., Greenville, Ohio.

Mar. 28. Alabama Vocational Association, at Phillips High School, Birmingham, Ala. Secretary, H. R. Culver, 105 Thach Hall, Auburn, Ala.

Apr. 4–6. Illinois Vocational Association, at Sherman Hotel, Chicago, Ill. Secretary, Orlin D. Trapp, Waukegan Township High School, Waukegan, Ill.

Apr. 5–6. California Industrial Education Association, at Civic Auditorium, San Jose, Calif. Secretary, Lee D. Bodkin, 131 Education Building, University of California, Los Angeles 24, Calif.

Apr. 11–13. Michigan Industrial Arts Association, at Civic Auditorium, Grand Rapids, Mich. Secretary, Eugene B. Watkins, 4029 Allen St., Bay City, Mich.

Apr. 11–13. Michigan Industrial Education Society, at Civic Auditorium, Grand Rapids, Mich. Secretary, Eugene B. Watkins, 4029 Allen St., Bay City, Mich.

Apr. 12. Industrial Education Conference, at Iowa State College, Ames, Iowa. Secretary, Lowell L. Carver, 101 Industrial Arts Building, Iowa State College, Ames, Iowa.

Apr. 12. Tennessee Vocational Association, at Nashville, Tenn. Secretary, W. A. Seeley, 111 East Cordell Hull Building, Nashville, Tenn.

Apr. 12–13. Connecticut Industrial Arts Association, at Teachers College of Connecticut, New Britain, Conn. Secretary, Carl H. Hubachek, 21 Sunset Road, East Haven, Conn.

Apr. 12–13. Missouri Industrial Education Association, at University of Missouri Industrial Arts Building, Columbia, Mo. Secretary, M. L. Stewart, state director of education, State Department of Education, Jefferson City, Mo.

Apr. 19–20. Washington Industrial Arts Association, at Senior High School, Kennewick, Wash. Secretary, Wallace Bennth, 819 West 19th St., Kennewick, Wash.

Apr. 20. Utah Industrial Arts Association, at Glendale Junior High School, Salt Lake City, Utah. Secretary, Leland V. Bangerter, South Junior High, 4300 Madison, Ogden, Utah.

Apr. 23–26. American Industrial Arts Association, at Hotel Muehlenbach and Municipal Auditorium, Kansas City, Mo. Secretary, Kenneth W. Brown, Box 2350, Buffalo 23, N. Y.

Apr. 27. Virginia Council of Industrial Education Clubs, at George Washington High School, Alexandria, Va. Secretary, Albert R. Connors, Newport News High School, Newport News, Va.

OHIO INDUSTRIAL ARTS ASSOCIATION

The Ohio Industrial Arts Association will hold its annual convention March 21, 22,

(Continued on page 8A)

COLUMBIAN WOODWORKERS' VISES MEET EVERY NEED . . .

Completely redesigned, Columbian Woodworkers' Vises offer you a real opportunity to write your own specifications—exactly as you want them!

You have your choice of 2 sizes—specify (7) for 4 x 7" jaws with 9" opening or (10) for 4 x 10" jaws with 12" opening. Also your choice of 2 different continuous screw mechanisms—specify (R) for Rapid Acting "Power-Slide" Nut, or (C) for Solid Nut type. You may select between (P) Plain or (D) Dog type front jaws. You may specify (W) Seasoned Hardwood Handle, (T) Tubular Steel Handle, or (S) Adjustable Steel Handle.

For example, No. 7CDW specifies 4 x 7" jaws, 9" opening, solid nut mechanism, dog type front jaw, seasoned hardwood handle—old catalog No. 5CD.

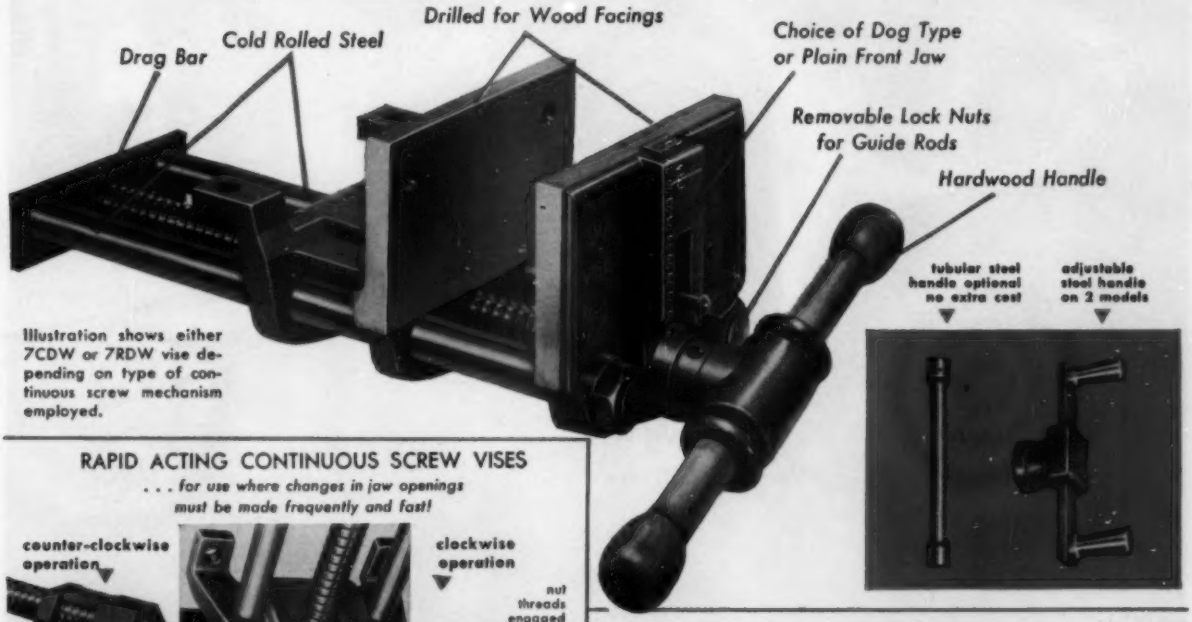
Drilled for Wood Facings
Cold Rolled Steel
Drag Bar
Choice of Dog Type or Plain Front Jaw
Removable Lock Nuts for Guide Rods
Hardwood Handle
tubular steel handle optional no extra cost
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Illustration shows either 7CDW or 7RDW vise depending on type of continuous screw mechanism employed.

RAPID ACTING CONTINUOUS SCREW VISES

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This new engineering triumph is the *world's safest* band saw! Exclusive Automatic Blade Tracking makes blade changing quick and easy • One-hand blade guide control • Blade guides reverse, offsetting blade to cross-cut any length stock (up to 6" width) without throat interference • Sealed ball bearings • Maximum safety — everything enclosed except essential cutting portion of blade • Extra cross-slot in table permits use of miter gauge as fence for resawing as well as crosscutting • Pre-set blade tensioning.

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The big, heavy-duty Magna 4-in. Jointer with the longest (28") table, largest (3" x 21¾") fence in its class, has adjustable infeed table, fixed outfeed table • Knives individually micro-adjustable, safety-tapered • One-knob Fence Lock controls tilting of fence • 3 adjustable Auto-stops • Spring-controlled Safety Guard • One-piece fence casting is far more rigid, larger (21" x 3").

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6-IN. BELT SANDER WITH AUTOMATIC BELT TENSIONING

Compare these big features with those of any other belt sander: Single-knob Control gives Automatic Belt Tensioning; instant belt removal • 6-in. by 16½-in. Back-up Plate for large work in horizontal or vertical position • Table tilts in either direction, mounts as fence on either side • Tilts, locks in any position from horizontal to vertical • Maximum safety—belt edges protected by side frames.

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18-IN. JIGSAW QUICK-CHANGES TO SABER SAW

The Magna 18-in. Jigsaw gives you greater precision, capacity and ease of adjustment • Full 18" throat permits cutting to center of 36" circle • Simply pivot the arm and it becomes a saber saw with unlimited capacity, or a filing machine • Cuts stock up to 2" thick, thin copper and brass • Single-knob blade tension control • Blower cools blade, keeps cutting line sawdust-free • Table tilts 45°.

MAGNA 9-IN. SAW WITH "THE HELPING HAND"

The new Magna 9-in. Saw is the only tilt arbor saw with "The Helping Hand"—a built-in extension which makes the largest (34" x 24") effective table on the market, allowing bigger rip and cross-cut capacity than even 10-in. saws! Check these important features: Colored Safety Zone Table Insert cannot catch work piece • Epicyclic Speed-gear Control gives you full 45° tilt with only 10 turns of knob (40 to 60 turns on other saws!) • Single-knob Control—push for blade height, pull for tilt • Self-aligning Fence locks both front and back with single knob • Externally adjustable Tilt Stops, easy to reach • Exclusive pressure-cast tub front bolted rigidly to table, coordinates all controls • 3 Auto-stops on Miter Gauge • Inter-change Arbor for quick change of blades • Constant belt tension at any degree of tilt • Saw Guard optional.

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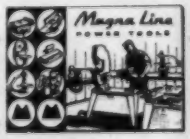

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ASSOCIATION NEWS

(Continued from page 4A)

and 23 at the Neil House, Columbus, Ohio.

Richard O. Knight, supervisor of industrial arts in Columbus, is the convention general chairman.

Topics to be discussed at the general sessions include: "What Shall We Teach in Industrial Arts?," "Getting Acquainted with the State Board of Education, Its Functions and Problems," "A Practical Approach to the Evaluation of Pupils," "Using Closed Circuit Television as an Effective Teaching Device," and "Problems of the Beginning Teacher."

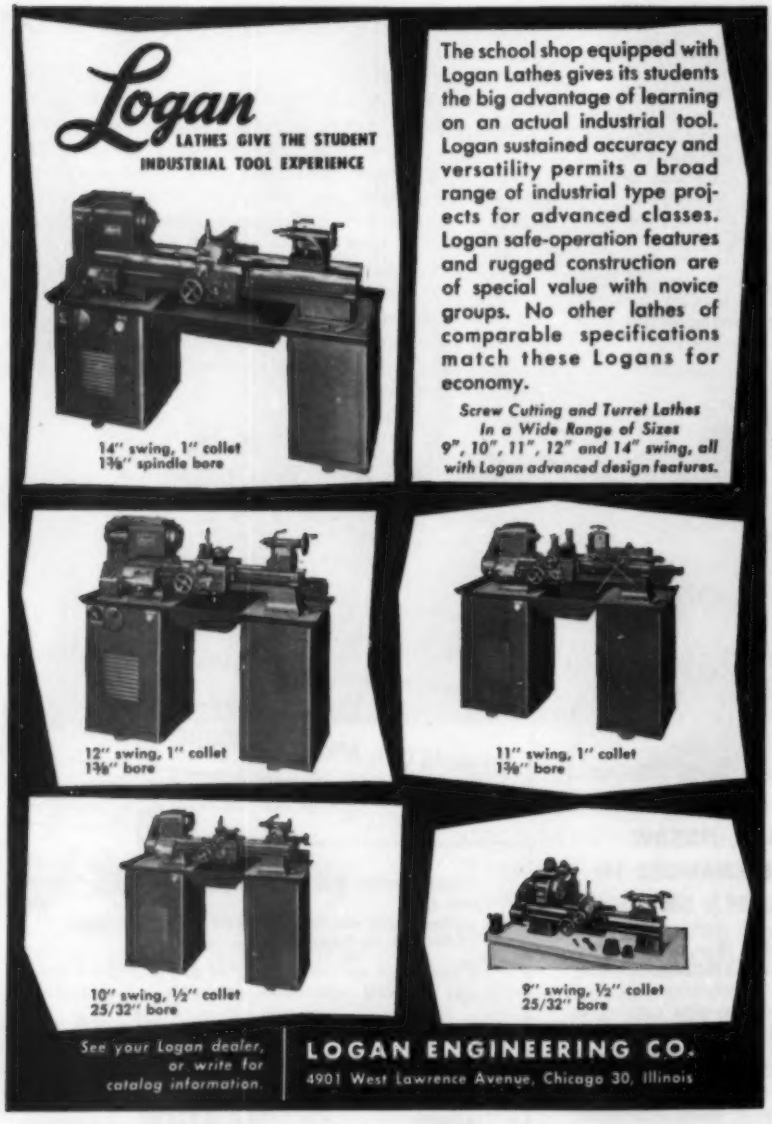
Speakers and discussion leaders scheduled for the general sessions of the convention are: G. Wesley Ketcham, consultant in industrial arts, Connecticut State Department of Education; and W. I. McCord, electronics division of the Diamond Specialty Company, Lancaster, Ohio.

Dr. Harold H. Eibling, superintendent of public schools, Columbus, will speak at the annual banquet on Friday night.

The Saturday morning session will feature demonstrations in the several industrial-arts areas.

Officers of the association for this year are: president, J. E. Morhardt, supervisor of industrial arts in Toledo; vice-president, Richard O. Knight, Columbus; treasurer, Dean F. Kittle, Lima Shawnee High School; and secretary, C. R. Hawes, Greenville.

A new publication, "Looking Into Ohio Schools," is scheduled to be off the press and ready for distribution at the State convention. The 200-page book has been prepared entirely by the Ohio Industrial Arts Association. — *Arthur W. Craft, publicity chairman.*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LATHES GIVE THE STUDENT INDUSTRIAL TOOL EXPERIENCE
14" swing, 1" collet 1⅜" spindle bore
The school shop equipped with Logan Lathes gives its students the big advantage of learning on an actual industrial tool. Logan sustained accuracy and versatility permits a broad range of industrial type projects for advanced classes. Logan safe-operation features and rugged construction are of special value with novice groups. No other lathes of comparable specifications match these Logans for economy.
Screw Cutting and Turret Lathes In a Wide Range of Sizes 9", 10", 11", 12" and 14" swing, all with Logan advanced design features.
12" swing, 1" collet 1⅜" bore
11" swing, 1" collet 1⅜" bore
10" swing, ½" collet 25/32" bore
9" swing, ½" collet 25/32" bore
See your Logan dealer, or write for catalog information.
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FOURTH ANNUAL REQUISITION NIGHT

The Allegheny County Industrial Arts Association held their fourth annual requisition night on Wednesday evening, January 23, at Har-Brack Senior High School, Natrona Heights, Pa.

The program consisted of a dinner at 6:30 p.m., followed by an inspection tour of the commercial exhibits, and the distribution of catalogs and materials from firms not represented.

The general meeting was conducted at 9:00 p.m., with comments and discussion of requisitioning by shop teachers and exhibitors.

The regular business meeting followed.

The annual requisition night affords an opportunity to the administrator and school personnel to see the latest machines and materials available, and to compare products, secure prices, and find new sources of supply, besides making contacts with the dealers.

NEW OFFICERS ELECTED

The Minnesota Trade and Industrial Association announces its new officers for the 1956–57 term. They are: president, Milton Larson, Dunwoody Institute, Minneapolis; vice-president, Vernon Eck, Dunwoody Institute, Minneapolis; and secretary-treasurer, Rudy Grunich, Ramsey Vocational School, St. Paul.

MASSACHUSETTS INDUSTRIAL EDUCATION SOCIETY

The annual banquet of the Massachusetts Industrial Education Society was held on Saturday, January 26, 1957, at 6:00 p.m., at the Hotel Continental, Cambridge. The evening consisted of a social hour, dinner, guest speaker, and prizes contributed by various industrial suppliers.

The speakers were Dr. James Baker and Dr. Harold L. Gear of Boston University. Their topic, "Facing Issues in Industrial Education," dealt with an examination by an administrator and by an industrial-arts teacher of current issues and problems concerning industrial education and its relation to general education, industrial education in today's secondary schools, and administrative problems in industrial education.

Approximately 200 men were in attendance. The January banquet has been a high point in each school year for a long time in this society which was founded in 1897.

— *A. H. Teittinen.*

SECOND ANNUAL SUMMER WORKSHOP

The Birch Coulee Industrial Arts Club in co-operation with the Bemidji State Teachers College and the Vocational Division of the Minnesota State Department of Education has set the dates of August 18 to 24 for the Second Annual Minnesota Industrial Arts Summer Workshop. The workshop will again be held at the State Educational Camp on Lake Arrowhead, north of Virginia, Minn.

The workshop will be conducted in the area of machine shop with special emphasis on the use of the metalworking lathe in the general shop. Professor O. D. Lascoe of Purdue University, will serve as head instructor. He is director of the Machine Tool Laboratory at Purdue and is author of many publications in the metal working field.

A representative of the Bemidji State Teachers College will serve as workshop supervisor.

Persons desiring to attend should contact Floyd Wurscher, general chairman, Second Annual Minnesota Industrial Arts Summer Workshop, Gaylord, Minn.

Teach with the tools industry prefers . . .

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"LIGHT-HEAVYWEIGHT"

6" JOINTER

Designed for extra safety— easier teaching—longer service!

Like all Walker-Turner "Light-Heavyweights," this rugged jointer has the advanced safety and working features that help to make student training more effective. Its patented dual purpose guard permits planing stock ribbon-thin *with unequalled safety*. The extra large table surface (over 7" wide and 37½" long) is very easy to work on. And the table is designed for speedy, accurate depth adjustment. Fence moves across full width of table for rabbeting, tilts to 45°, and has index plunger. A rear guard is provided to keep the knives covered at all times.

See that your students have the advantage of developing their craftsmanship with the Walker-Turner 6" Jointer and other "Light-Heavyweights"—the tools that are preferred by industry for accuracy, long life, and true economy. Mail coupon for details, or contact your W-T distributor for a demonstration. He's listed under "Tools" in your classified telephone directory.

EXCLUSIVE DUAL PURPOSE SAFETY GUARD

Permits planing stock to uniform ribbon thinness. Pressure of thumb holds small pieces down while guard controls side pressure.

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Division of Rockwell Manufacturing Co.
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☐ Please send name of my Walker-Turner distributor.
☐ Please send information on Walker-Turner 6" Jointer.
☐ Please send literature on complete Walker-Turner line.

Name_____ Title_____

School_____

Address_____

City_____ Zone_____ State_____

Try to match THIS for price and performance!

NEW

Yates-American Jointer

...with exclusive Shear-Cutting Fence*

Cuts clean —even across knots!

Big, Big Table!

64 inches long
on 8″ Model J-138

50 inches long
on 6″ Model J-136

Low, Low Price!

only $118.75
for 6″ model, less motor, switch, and cabinet

$269.00 for 8″ model, less motor, switch, and cabinet

Many other new features, including DELUXE SAFETY GUARD which allows stock to pass under the guard, for maximum protection of students. Get all the facts—send coupon for Bulletin PT-26.

Smooth, Smooth Cut!

Fence at "normal" position is at 90° to head. "Shear" position, at 10° angle, gives shearing action at point of cut for extra-smooth finish, even on unusual grained hardwoods and knotty stock.

Tear out coupon and mail today!

*Patent Pending

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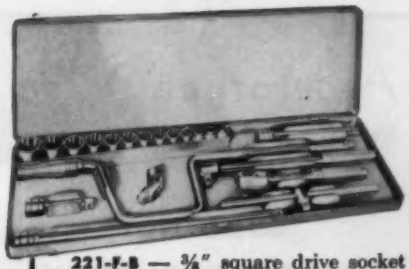
Snap-on*

CAREER TOOLS

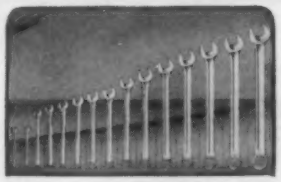
for school shop training

Train your students with *Snap-on* tools and give them the full benefit of shop instruction. Send them to their first jobs with a full knowledge of the tools used by most top-flight mechanics.

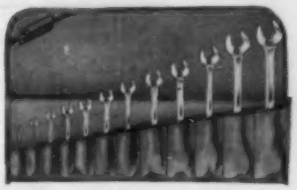


221-F-8 — ⅜" square drive socket wrench set — 21 matched units for tight places, hard-to-reach nuts. Many other sets available.

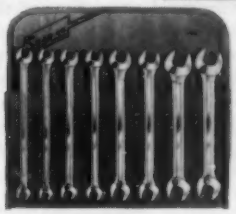
XV-611-K — 11 offset Boxocket® wrenches from ⅜" to 1¼". Knuckle-saving clearance, powerful leverage.



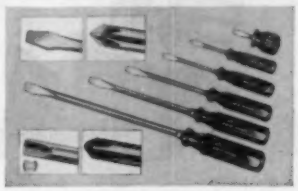
OEX-715-K — 15 Combination wrenches from 5/16" to 1¼". Combines safe Boxocket® leverage and open end nut-turning speed.



OE-812-K — 12 Open-End wrenches from ¼" to 1⅛". Covers practically every nut-turning job in automotive and tractor repair.



LTA-808-K — 4 pairs of wrenches for every tappet job. Sizes 7/16" to ⅞". Thin heads and long handles provide both speed and safety.

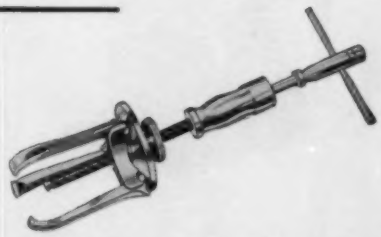


SNAP-ON SCREW DRIVERS — sizes and blade tips for every job. Shock-proof handles, tough well-anchored blades.

SNAP-ON PLIERS — built to last longer and work better. Grippers, cutters, needle-nose and specials.

PC-170-K — set of 17 chisels and punches. Gives you the right size and type for practically every job.

MT-315-B — motor tune-up set with 15 units to tell young mechanics what's wrong with a motor.



CG-273-H — 3-jaw medium size slide hammer puller for safe, uniform pulling of wheels, gears, etc.

TORQOMETER WRENCHES—25 models, 0-30 in. lb to 0-4000 ft lb tell specified tensions as easy as telling time.

Detailed information and illustrations of all *Snap-on* tools are included in catalog V. Write for your copy listing over 4,000 quality tools for school shop training.

SNAP-ON TOOLS CORPORATION

8074-C 28th Avenue • Kenosha, Wisconsin

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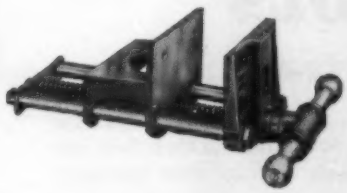
A Morgan Vise for Every School Shop Need

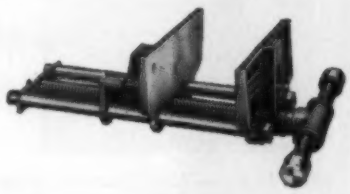
Woodworking

SOLID NUT CONTINUOUS SCREW VISE



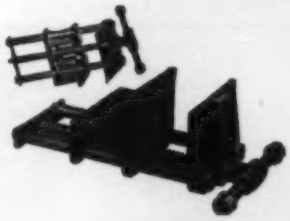
Built to withstand the most severe service. Simple construction insures trouble-free operation. Has extra heavy cold rolled screw and solid nut for long life. Interchangeable cold rolled side bars are threaded and held in place by hexagon nuts — not rivited. Stop in front jaw.

QUICK ACTION VISE



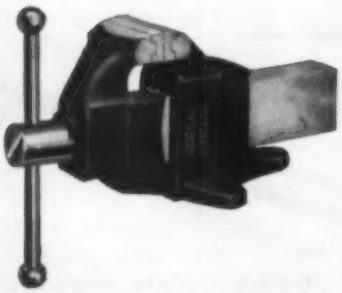
The most simple and effective of the screw adjusting type vises, giving you speedy gripping power. There is absolutely nothing about this vise that can get out of order. Intercepted threads on the screw operate in a half nut of high quality bronze. Carefully machined working parts.

18A DUAL PURPOSE VISE



Combines the speed and convenience of the rapid action vise and the smooth positive action of the continuous screw vise. The cold rolled screw is machined with a continuous buttress thread operating on a new floating nut which permits rapid action with smoother screw action. Adjustable stop in front jaw.

Metalworking



MACHINIST'S BENCH VISE Solid Jaw and Stationary Base

Special semi-steel casting. Sliding bar's accurate milling means a snug fit of the broached base opening. The solid steel forged screw engages in a malleable iron acme threaded nut. A lifetime, rigid-gripping vise.

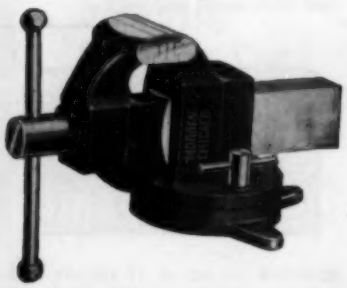
Write today for free catalog showing the complete Morgan line.

EVERY MORGAN VISE UNCONDITIONALLY GUARANTEED

Continuous rigid controls and inspections, finest quality materials and workmanship make it possible for Morgan to *guarantee every vise unconditionally without time limit restrictions.*

Rugged, dependable lifetime vises are what you get when you specify Morgan vises for your school shop. Becaues of their sturdy construction they stay on the job through daily strenuous use. You're time and money ahead in repairs and replacements.

MACHINIST'S BENCH VISE Solid Jaw and Swivel Base



May be rotated 360° and clamped in any desired position. A specially designed nut locks the base. There is no play despite heavy duty. Here is unusual rigidity and strength in a swivel base vise.

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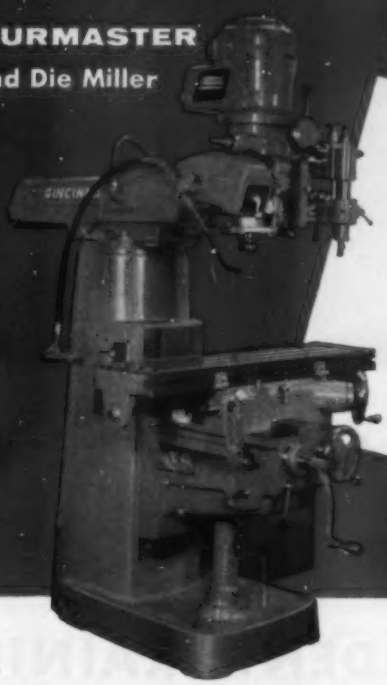
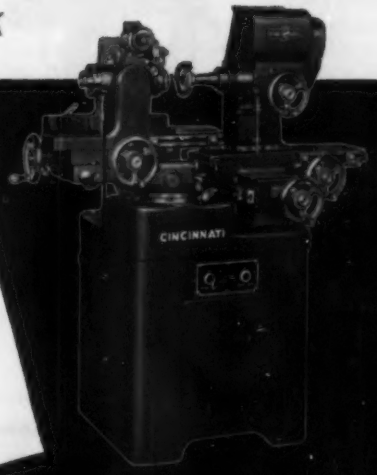
CONTOURMASTER
Tool and Die Miller



Instructions in milling dies will be quickly understood by students who have the advantage of operating a CINCINNATI® Contourmaster. These fine milling machines smoothly and automatically guide the cutter over the same vertical profile as followed by the tracing finger. Shaping attachment, twin rotary tables, and 18 other types of extra equipment available. Write for catalog No. M-1919.

They Give You
A BIG ADVANTAGE
In Teaching Tool and Die Work



Cutters for milling die and mold contours are sharpened in one chucking on CINCINNATI® Monoset Cutter and Tool Grinders. And you can teach your students how to make small intricate cutters . . . grind them complete from solid bar stock. The Monoset has many desirable features for sharpening ordinary cutters, too. Get the complete story in catalog No. M-1591-2.

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OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

THE CINCINNATI MILLING MACHINE CO. CINCINNATI 9, OHIO

YOUR SHOP NEEDS AN AMF DE WALT FOR SAFER, EASIER STUDENT TRAINING

MODEL GA for Vocational Training

12- and 14-inch radial arm saws. 12" blade cuts 3½" deep, 14" blade cuts 4½" deep. Rips 28⅜" wide, cross cuts 16" x 1" with standard arm. (Longer arm available.)

Uniform box-section non-retractable cantilever arm rotates 360° around the supporting column. Top-elevating crank. Quick-set miter locating latches at 0° and 45°. Eight (8) ball-bearing roller head rides directly on machined trackways inside arm. Direct-drive, totally-enclosed, fan-cooled motor (3425 r.p.m. full load), manual thermal switch. Calibrated miter, bevel, and rip scales, positive bevel-locating latches 0°, 45° and 90°. Steel table with legs, wood top. 14" diameter automatic safety guard with kickback device. (Select motor, saw blade and arm size from models shown below.) Power safety brake (optional).

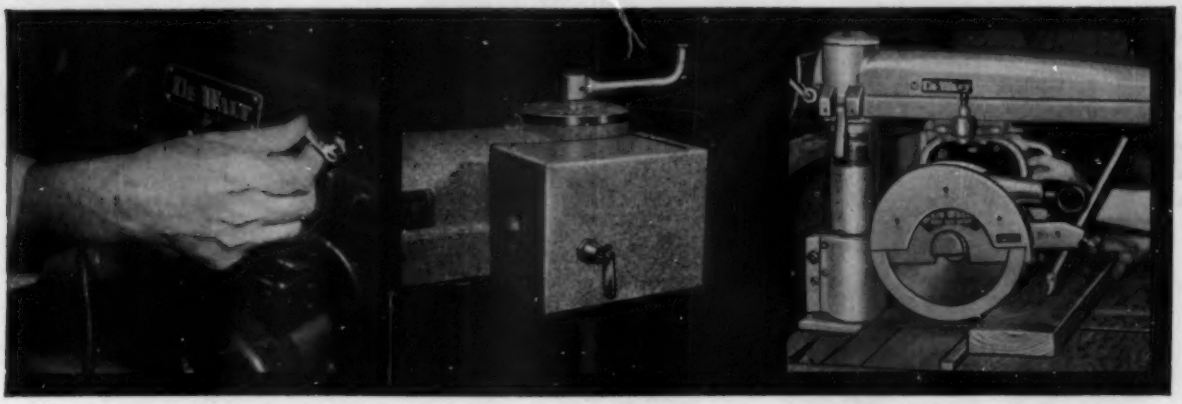
Model	Std. Saw Blade	H.P.	Motor 3425 R.P.M.
GAK	12"	2	Single-phase, 60-cycle AC, 115/230 volts
GAN	14"	3	Three-phase, 60 cycle AC, 220/440 or 550 volts
GAO	14"	3	Three-phase, 60-cycle AC, 115/230 volts
GAR	14"	5	Three-phase, 60-cycle AC, 220/440 or 550 volts

MODEL GW for Industrial Arts

10-inch radial arm saw, cuts 3" deep, rips 26" wide, cross-cuts 16" x 1". Uniform box-section non-retractable cantilever arm rotates 360° around the supporting column. Top-elevating crank. Quick-set miter locating latches at 0° and 45°. Four (4) ball-bearing roller head rides directly on machined trackways inside arm. 1½ h.p. direct-drive, protected, fan-cooled motor (3425 r.p.m. full load), manual key switch. Calibrated miter, bevel, and rip scales, positive bevel-locating latches 0°, 45° and 90°. Steel table with legs, wood top. 10" diameter saw and "Auto-float" safety guard with kickback device. Power safety brake (optional).

Model	Saw	H.P.	Motor 3425 R.P.M.
GW-1	10"	1½	120/240 volts, 1-phase, 60 cycles AC
GW-M	10"	1½	220, 440 or 550 volts, 3-phase, 60 cycles AC (Specify One Voltage)

AC 2-phase or 50 cycles available on request for GA and GW.



Let your local De Walt Dealer show you why De Walt is the safest, most efficient, easiest-to-use woodworking tool of all... how it makes *teaching* easier.

You need De Walt SAFETY. *Only the AMF De Walt® Power Saw* offers you such a combination of safety features.

Top-side cutting action lets the operator see the blade *and* the layout mark for every cut. Blade action holds the material down and against the fence for added safety. *Pull-across cutting* lets the operator move *with* the saw for most cuts, not against it as with other tools. *All controls are above* the table and clearly marked for safe, sure set-ups every time. *Original Safety Key Switch* prevents unauthorized use. *Work is always level* and moves in a straight line – you fit the *saw* to the *work*, not vice versa as with other tools. No balancing lumber at awkward and dangerous angles. *Exclusive tool guard* adds still greater safety – completely encloses shaper knives and other tools, yet adjusts to any size lumber in seconds. *Special De Walt Power Brake* stops saw blade in a few seconds for maximum protection. *Spir'Ator Safety Return* automatically draws motor and blade to a safe position when released.

You need De Walt EFFICIENCY. One De Walt Power Saw actually does the work of *12 different power tools* – and does each one *as well or better* than a single purpose machine!

As a saw, De Walt makes every possible cut, quickly, safely, with unsurpassed accuracy. Instantly adjusts to any miter, bevel, or compound angle – sets up for either right- or left-hand ripping. Allows repeated cuts from one marking. *With a dado head*, De Walt's *precision depth control* and *top-side cutting* give on-the-line accuracy for all cuts. *Full-tilting arbor* simplifies rabbeting, grooving, radius and saucer cuts. *As a shaper*, De Walt provides maximum flexibility by tilting, raising, or lowering to *any* desired position – gives a *full 50% more shapes per cutter*. And you have another rotary tool every time you attach a different head to De Walt's powerful direct-drive motor. *Your one De Walt gives unsurpassed efficiency for every cutting job.*

You need De Walt PRACTICALITY. No other single piece of woodworking equipment makes as much "sense" as a De Walt in your shop, because no other offers such practical advantages.

With De Walt's great versatility, you can often save the cost of a number of other machines which frequently stand idle. Your De Walt will be the most-used machine in the shop. The De Walt can be placed and operated *against a wall – takes up 75% less space than old style table saws.* And with a De Walt, you can be sure you are training your students on the kind of equipment they will later use. For De Walt is the choice of woodworkers throughout industry – for carpentry, construction, pattern shops, cabinetry, maintenance and crating departments – tried and proved by *millions* of operators.

You may have seen the De Walt Power Saw demonstrated at the National or your State Convention. If not, *see your Dealer* for a demonstration. Send the coupon below for your FREE copy of "Job-Tested Cutting Methods". Valuable new shop teacher's aid now available – "Easy Ways to Expert Woodworking" – just $3.95.

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STANLEY SHOP TALK

CATALOG No. 34

This STANLEY TOOL CATALOG with the special school index is a particularly useful book of reference and tool information for the shop teacher.

Packed with descriptive facts and hundreds of illustrations, it makes tool selection sure and easy. The handy school index recommends items found most useful and serviceable for school use. It is based upon Stanley's long experience and the advice of educators.

Use the coupon to send for your free copy of the STANLEY TOOL CATALOG with special school index. We will include a 9-page list entitled, *"Suggested Specifications for Equipping a General Shop."*

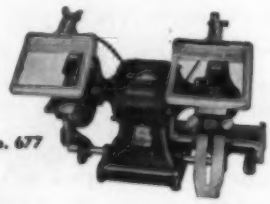
new! "SURFORM"®

This is the amazing new tool everyone is talking about. 450 cutting edges cut wood, fibre boards, plastics, soft metals, etc. Fast, easy to use . . . both tools have same replaceable blade. Sure to be popular and useful in your school shop.

Screw-Mate®
Stanley No. 1525
Drill-Countersink

This new Screw-Mate does 4 jobs at once — drills pilot hole and shank clearance, countersinks, and always stops at exactly the right screw depth. Fits chuck of hand drill, power drill or drill press. 24 sizes — from ½" x No. 5 through 2½" x No. 12. ¼" shank. Screw-Mate counterbores and plug cutters also available.

BENCH GRINDER



Especially designed for the school shop. The grinding attachment is for all chisels and plane irons up to 2⅝" wide. Equipped with "Flud-Lite" Eye Shields that cannot be moved to non-guarding position.

CATALOG NO. 567

Get this up-to-date STANLEY ELECTRIC TOOL CATALOG now — it includes new belt and orbital sanders. You will find it full of useful facts for the shop teacher. Be sure to order this catalog with the STANLEY TOOL CATALOG described above. Check both items on the coupon.

Use this coupon for more detailed information and school shop help

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Improved Black & Decker 7" Sander-Grinder is POWER-BUILT to work harder, longer, faster!

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PARKS PLANERS Give Your Students Practical Experience on Popular Industrial Machines

Students learning on Parks Planers benefit not only from the safe, easy, and accurate operation of these planers, but also from the practical experience of working on the same type of high-speed, precision built planers they will eventually use in their trade. The Parks No. 20, 20" Planer (at right) has a 4-knife cutter-head with a speed of 3600 R. P. M. and offers two feed speeds—20 and 40 F. P. M. or 40 and 80 F. P. M. Available with knife-grinding attachment at additional cost.

THE **PARKS** No. 20
20" Thickness PLANER
WITH KNIFE-GRINDING ATTACHMENT

THE **PARKS** HEAVY-DUTY
12" Thickness PLANER

At left is the Parks Heavy-Duty 12" x 4" Planer—a compact, sturdy thickness planer with feed speed of 16 F. P. M. at 4000 R. P. M. Will handle material as short as 6" and as thin as 1/16". Both planers are priced low enough for even the most modest shop budget. WRITE FOR COMPLETE DESCRIPTIVE LITERATURE.

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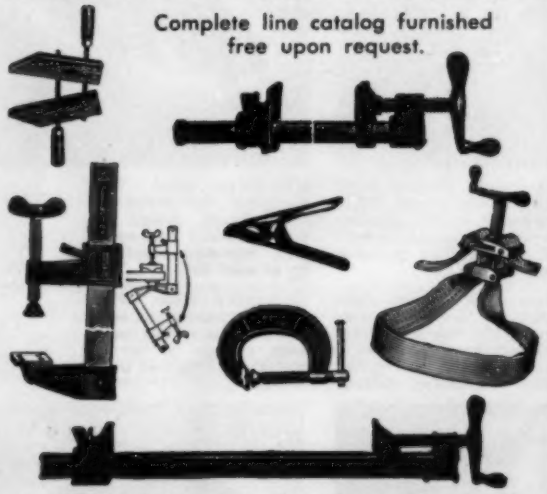

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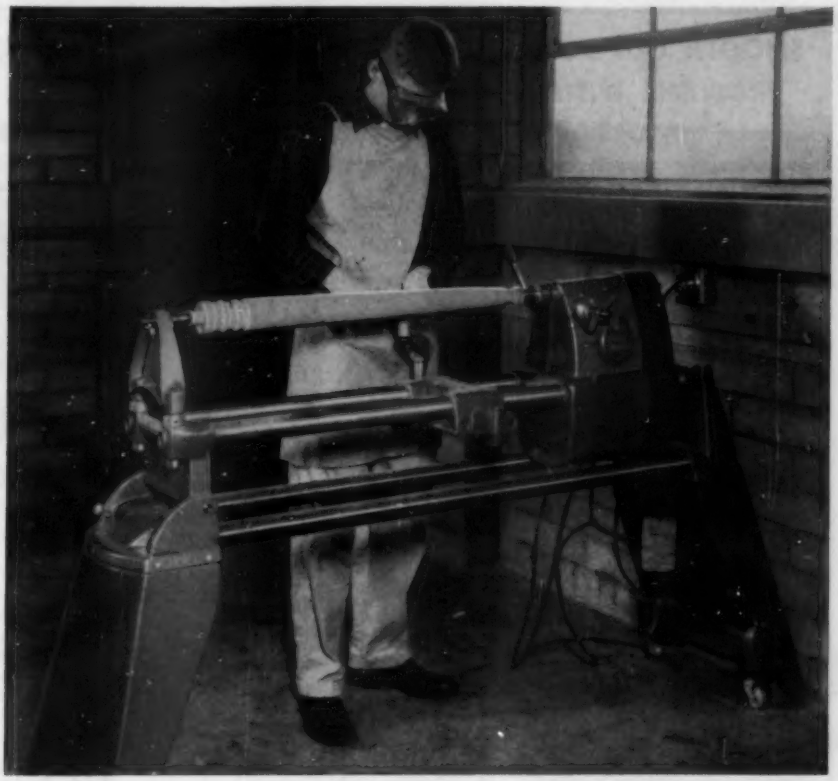

SHOPSMITH IS WHATEVER TOOL YOU NEED MOST AT THE MOMENT

All of a sudden everyone in the shop needs a lathe — or a drill press, or a saw — and every available tool is tied up. In seconds, your versatile SHOPSMITH® solves these traffic pile-ups! Simply convert it (in less than a minute!) to the tool you need most — 9" Saw, 12" Disc Sander, 16½" Drill Press, 34" Lathe, or Horizontal Drill with unlimited capacity, and each a superior, precision tool.

Rugged SHOPSMITH is the safest power tool ever designed. Exclusive Speed-Dial gives you correct tool speeds (700 rpm to 5200 rpm) for any operation. All belts and pulleys are enclosed with the built-in ¾ hp motor. Guarded safety-switch. Over-under saw guard. Special school model SHOPSMITH is priced to stretch your shop budget. Mail the coupon today for full specifications and details.

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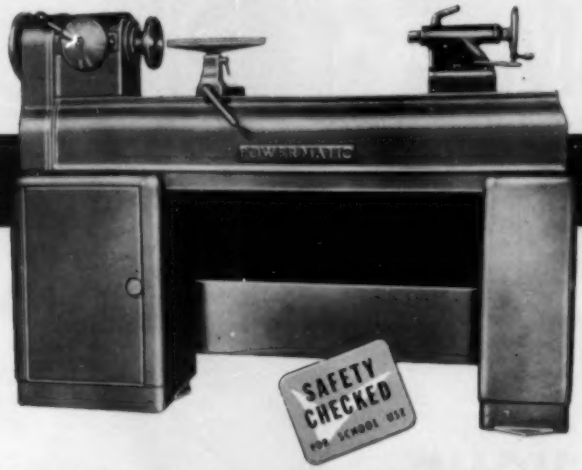

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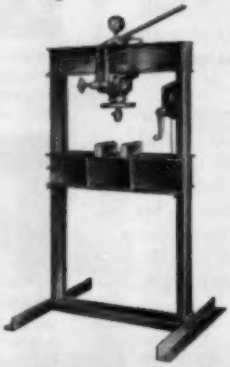

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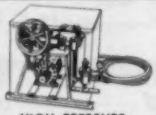
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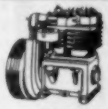
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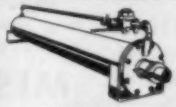
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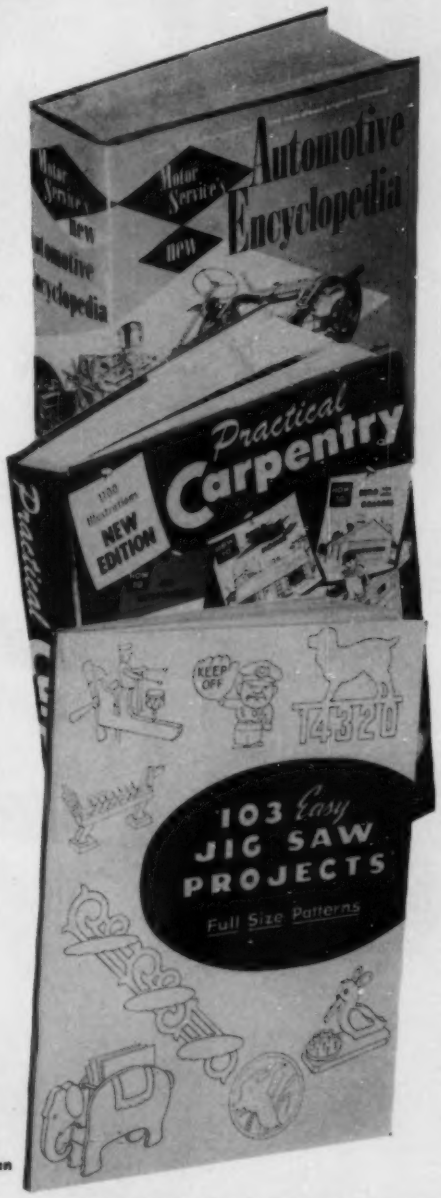

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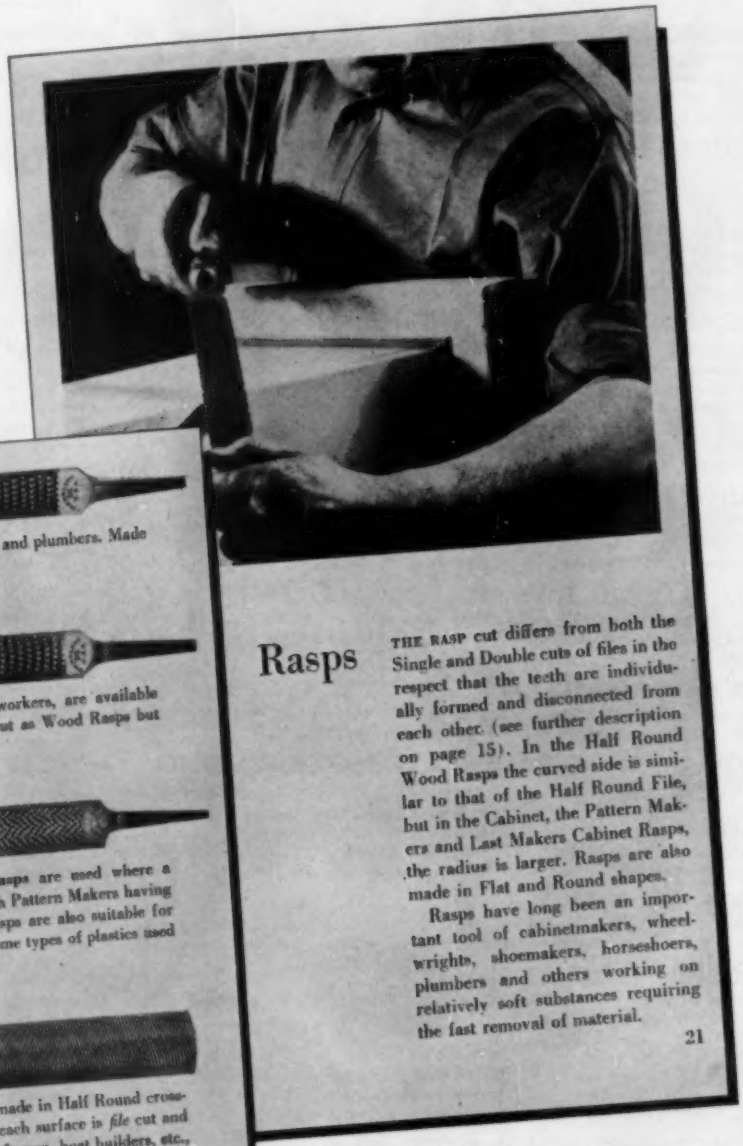

Rasps

THE RASP cut differs from both the Single and Double cuts of files in the respect that the teeth are individually formed and disconnected from each other. (see further description on page 15). In the Half Round Wood Rasps the curved side is similar to that of the Half Round File, but in the Cabinet, the Pattern Makers and Last Makers Cabinet Rasps, the radius is larger. Rasps are also made in Flat and Round shapes.

Rasps have long been an important tool of cabinetmakers, wheelwrights, shoemakers, horseshoers, plumbers and others working on relatively soft substances requiring the fast removal of material.

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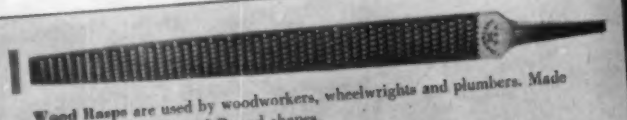
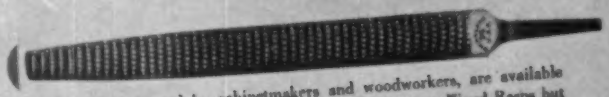


Wood Rasps are used by woodworkers, wheelwrights and plumbers. Made in Flat, Half Round and Round shapes.



Cabinet Rasps, used by cabinetmakers and woodworkers, are available in Cabinet and Round shapes, and in the style of cut as Wood Rasps but with relatively smaller degrees of coarseness.

Pattern Makers and Last Makers Cabinet Rasps are used where a smooth wood finish is required. Cabinet shape, with Pattern Makers having cut edges and Last Makers uncut edges. These rasps are also suitable for shaping various types of soft plastics, including some types of plastics used for pattern making.

4-in-Hand Rasp-File (*formerly Shoe Rasp*) is made in Half Round cross-section (without the usual sharp edge). Half of each surface is *file* cut and half *rasp* cut. A fine all-around tool for home craftsmen, boat builders, etc., as well as for shoemakers and shoe repairers.

Horse Rasps come in Plain (illustrated) and Tanged types and Flat section. Plain Horse Rasps are double ended. All have rasp teeth on one side and file teeth on the other.

22

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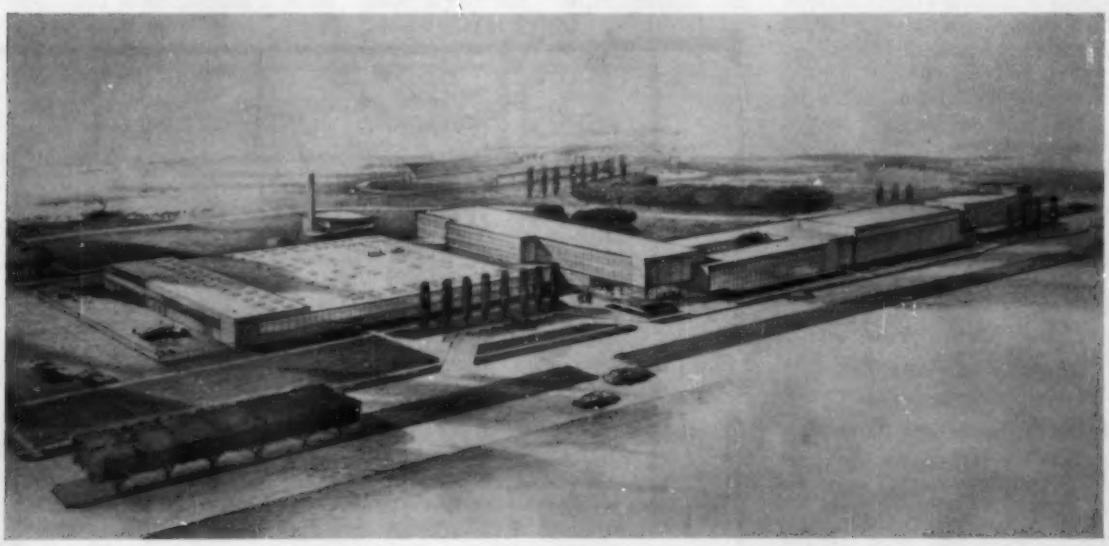
Industrial Arts and Vocational Education
The Shop Teachers' Professional Magazine
MARCH 1957

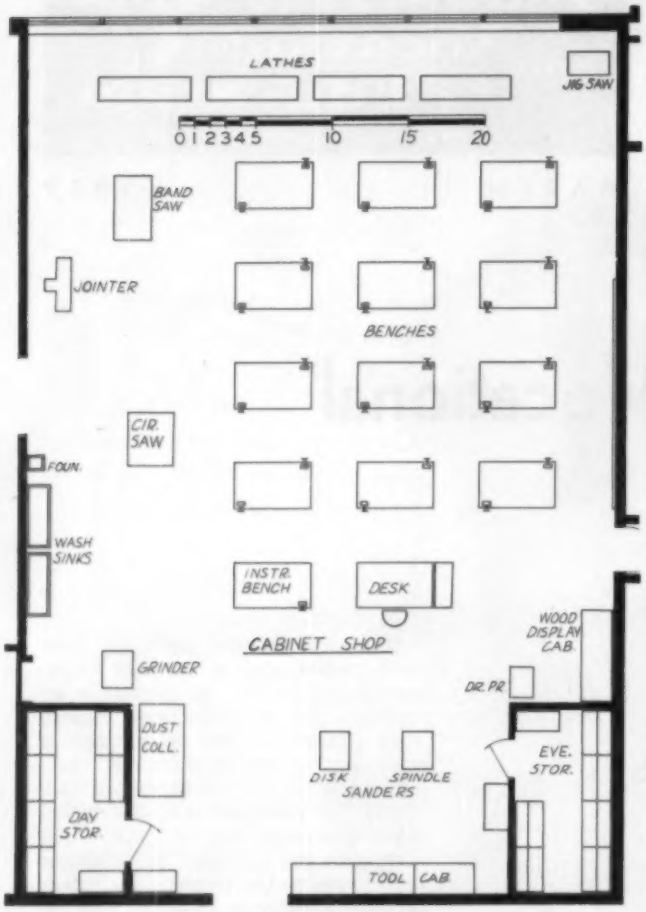
The New Dunbar Vocational High School

CLIFFORD J. CAMPBELL
Director and
CLAYBOURNE H. NORRIS
Curriculum Supervisor
Dunbar Vocational High School
Chicago, Ill.

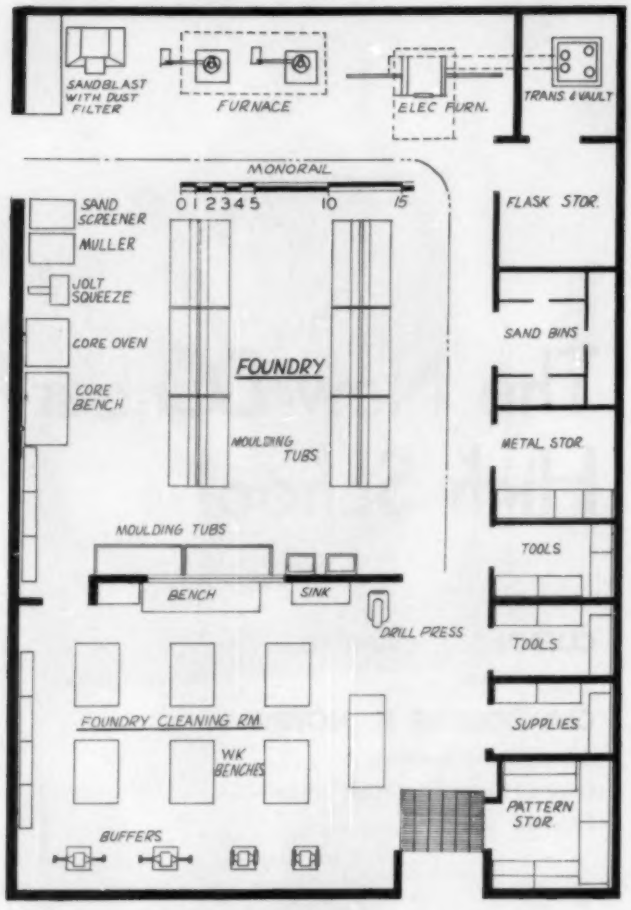
The Chicago board of education opened the Dunbar Vocational High School in September, 1942. Less than four hundred students and a faculty of 16 teachers comprised the initial organization. Housed in a small building originally designed for an elementary school and with inadequate equipment imposed by wartime shortages, Dunbar's modest and unobtrusive beginning created no wave of community acceptance; nor was civic pride inspired when Dunbar launched its program of trade and vocational education. However, under the able leadership of Clifford J. Campbell, director, student enrollment increased to 2100 by 1954. The curriculum was expanded, and additions were made to the faculty. The school completely outgrew its small and inadequate quarters. It took but a few years for Dunbar to make a positive impact on the public through its daytime and evening school program of vocational education. The critical need for skilled workers in the rapidly ex-



The New Dunbar Vocational High School, Chicago, Ill.
— Photograph, courtesy of Williams & Meyer Co., Chicago, Ill.



Cabinet shop



Foundry

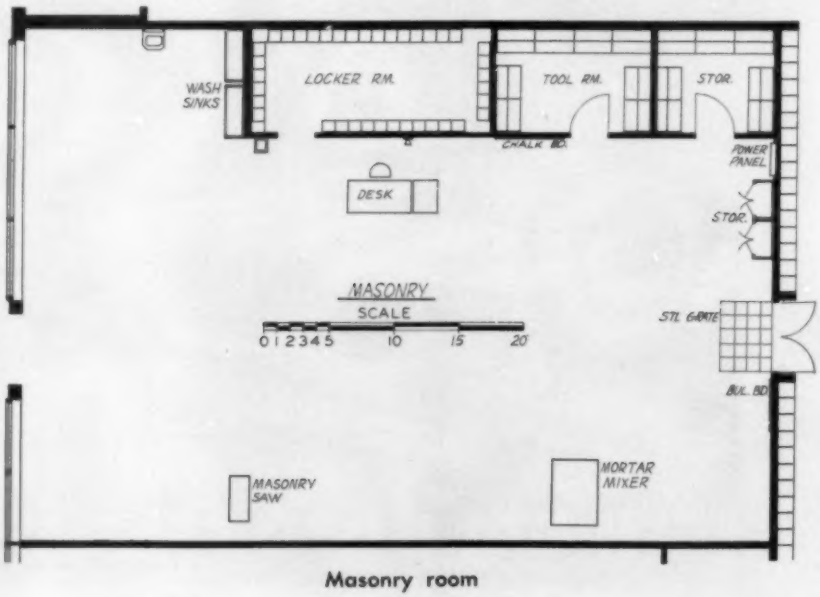
panding businesses and industries of Chicago placed Dunbar in a strategic position of service. The local community became increasingly sensitive to the inadequacies of Dunbar's physical facilities; the businesses and industries which employed the graduates of Dunbar became aware and appreciative of the school's plight. The clamor began for a new plant to house this fast growing institution.

In 1955 the Chicago board of education approved the erection of a new $5,000,000 building for the Dunbar Vocational High School. The building contains facilities for teaching 27 vocational shops plus classrooms and laboratories for English, mathematics, physics, chemistry, social studies, music, related technical subjects, and physical education.

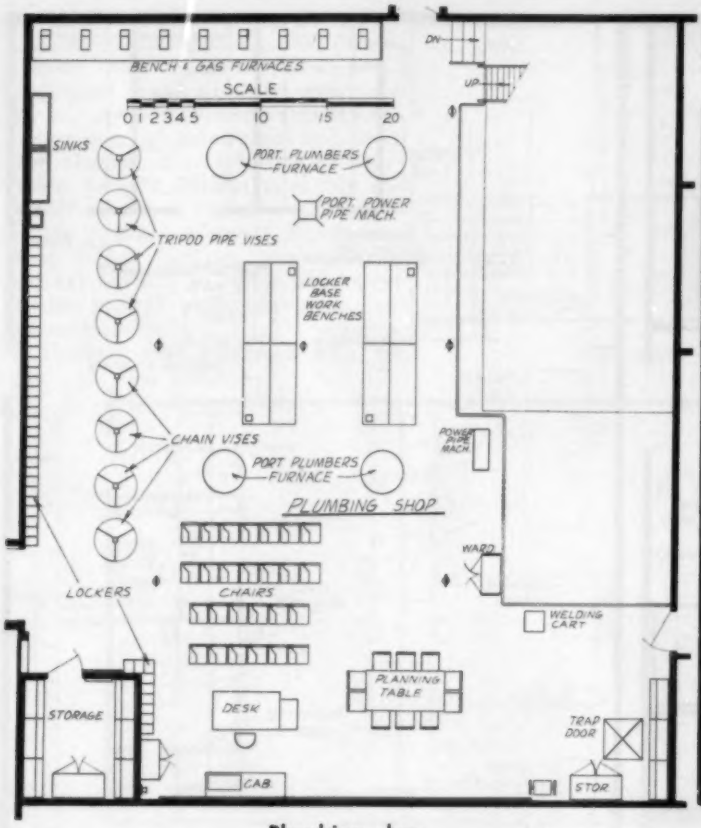
A Project in Democratic Planning

An interesting feature of the creation of the new Dunbar has been the manner in which members from all echelons of the Chicago public school system have contributed to its design.

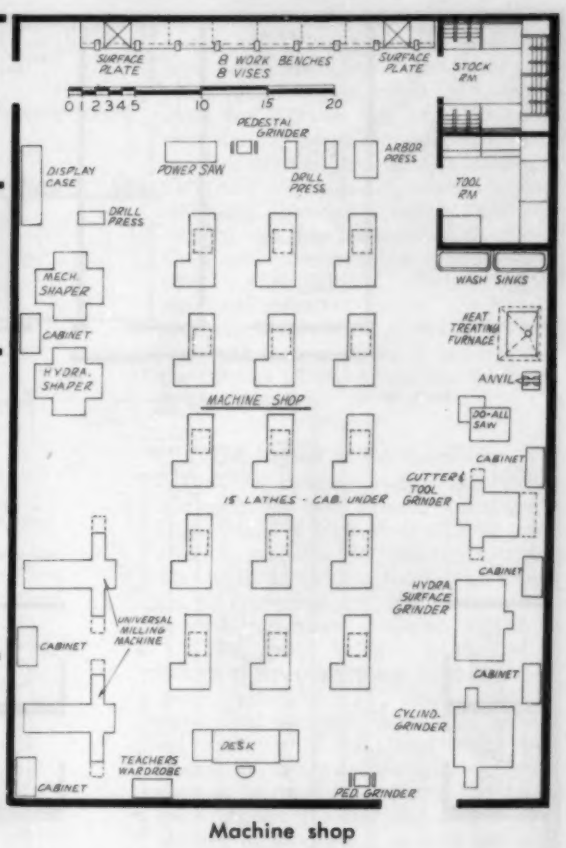
Dr. Benjamin C. Willis, general superintendent of Chicago public schools, laid the foundation for widespread participation by various committee groups in the planning of the new vocational high school. In his opening remarks to the administrative and department heads who gathered for the purpose of considering the problem of Dunbar's design, Dr. Willis stated that a school building should express in concrete and stone a philosophy of education. With-



Masonry room



Plumbing shop



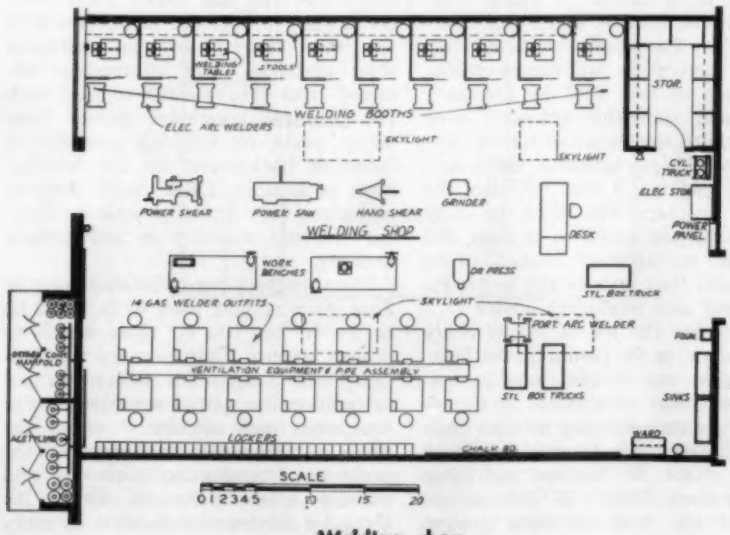
Machine shop

out first having an agreement upon a sound philosophy of vocational education, without first equating purposes and broad objectives of education with design, much time, effort, and money could be wasted in the construction of a building that would not fulfill its intended function. This philosophical principle permeated the thinking of all groups that contributed to the design of the new school.

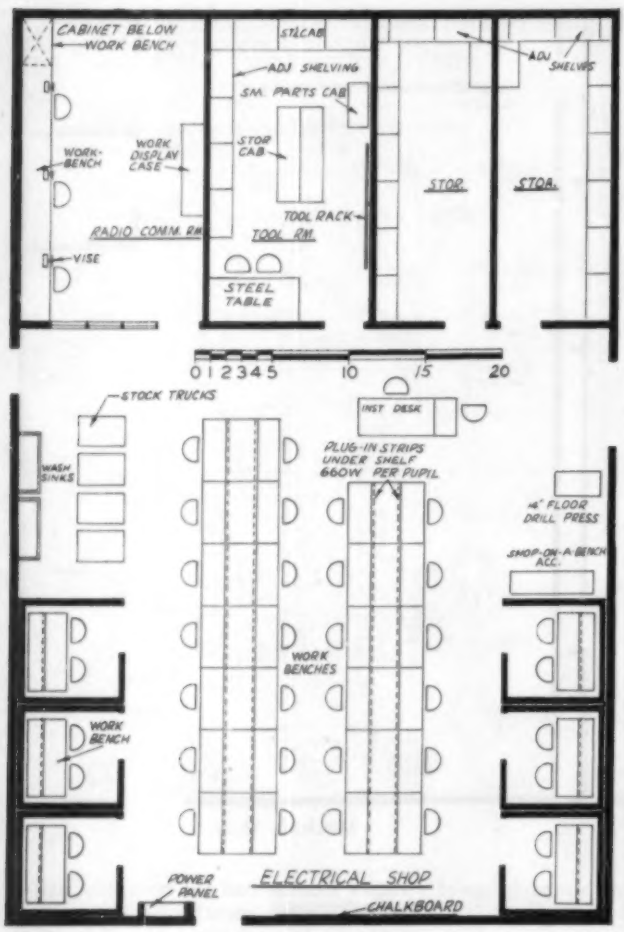
Teachers' Participation in the Planning

Rarely have teachers had the opportunity and privilege of sharing in the planning of shops and classrooms of a new school. The faculty of Chicago's Dunbar had the rewarding satisfaction, after months of painstaking planning, to move into a new $5,000,000 building and see their plans evolve into reality. Needless to say, the feeling of teachers in being identified with a tremendous creative undertaking, and the pride in knowing their unique contributions were acknowledged by administrators and translated by architects into the design of a new school, are deep and abiding. How was this accomplished? What enlightened leadership made possible this pooling of intelligence of teachers, administrators, supervisors, and architects?

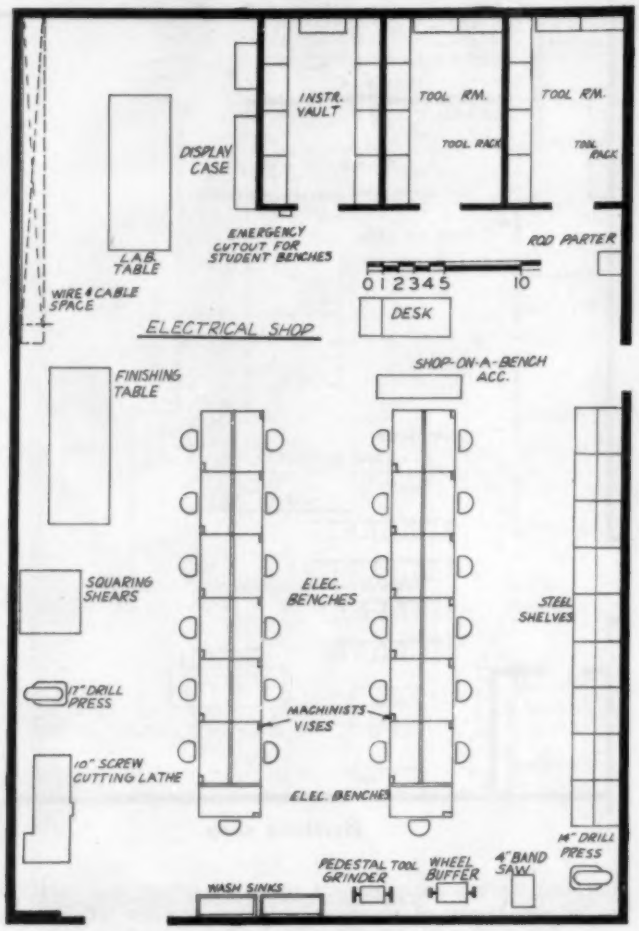
The structure of organization that permitted the flow of data, ideas, and suggestions extended from students and teachers to top-level administrators and architects. The planning groups reflected a democratic spirit of co-operation which recognized that a school is designed for people; that a school is concerned with the intellectual, social, civic, physical, spiritual, and emotional developments; and that a good school plant is one which helps attain maximum development of major objectives. They also recognized that children are essentially good, not bad; that people learn a great deal from one another; that teachers, furniture, books, equipment, classrooms, and school buildings



Welding shop



Electrical shop



Electrical shop

can create a mood and a spirit which are conducive to the stimulation of learning. A school can be a friendly place for boys and girls. The very structure and design of its buildings and facilities can help students appreciate and understand beauty, values, and spiritual ideals. A school is also a machine for learning. How efficiently this machine was to function became a major concern of those who contributed to the design of Dunbar.

Organization of Planning Groups for the New Dunbar Vocational High School

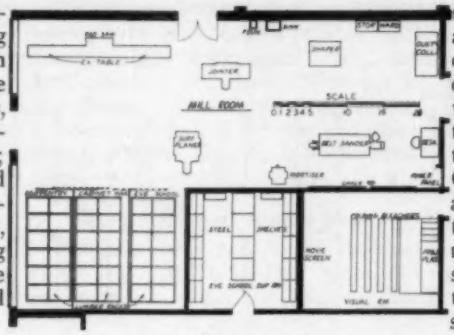
Hobart H. Sommers, assistant superintendent in charge of vocational education, and Clifford J. Campbell, director of Dunbar Vocational High School, shared the responsibility for pooling ideas and suggestions and establishing the framework upon which the architects designed the building. To supplement the work of the Chicago board of education architect, John C. Christensen, private architectural firms are being employed to design some of the larger new schools. Architects Holibard, and Root, and Burgee designed the new Dunbar building.

Much valuable information for the architects could be secured from a vocational high school that had been in operation for a number of years. Consequently, the faculty, under the direction of Mr. Campbell, conducted two years of meticulous preliminary study. As a result of this work by Dunbar's faculty and staff the architects were given detailed specifications for the layout of each shop, classroom, office, and auxiliary facility. It was felt that the ideas of teachers who work in daily contact with the problems of shop and classroom management would prove fruitful and thus provide the architects with sound and intelligent advice.

To expedite the job of letting every teacher share in the planning, the Dunbar faculty was divided into groups. Each group was supervised by an administrative staff member with an engineering background. Dunbar's assistant director, Neal F. Simeon, and shop superintendent, Everett M. Renfroe, coordinated the work of these groups. Warren A. Koerner, supervisor of drafting, co-ordinated the work of the vocational supervisors. Teachers were given tables of standards for such items as light, water, gas, and electric power in order to simplify the development of rough sketches and ideas. They were encouraged to acquaint themselves with the latest developments in vocational shop planning. The information obtained from this research coupled with the practical knowledge gained from many years of teaching provided a favorable background for the development of layouts. These rough sketches and plans were drawn to scale by Dunbar students majoring in architectural drafting.

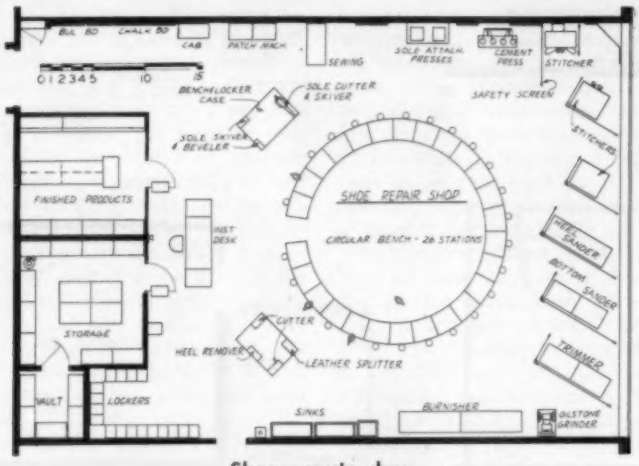
Shop teachers were allocated areas of floor space ranging from 40 ft. by 60 ft. to 72 ft. by 106 ft. upon which to project layouts. Their primary responsibility was to determine shop needs and to develop the spatial arrangements of equipment and machinery within the shops. Consideration was given to the problem of conducting both day and evening school programs within the shops for maximum utilization. In many instances two separate toolrooms were

provided in the same shop for expendable supplies of both day and evening classes. Other important factors which influenced design of shops were: ease in delivery of equipment and supplies, convenience of maintenance and cleaning, elimination or reduction of noise; safety hazards, elimination of dust and fumes, storage of explosive and inflammable supplies; adequate illumination, shop locker facilities, shop drinking fountains, visual education and lecture rooms, student traffic circulation, and communication.

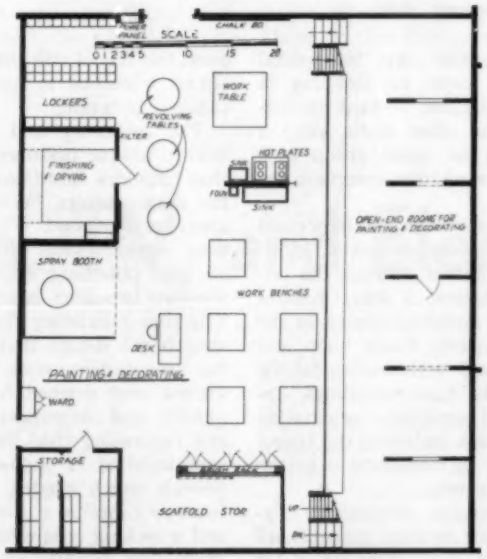


Mill room

Teachers were concerned with not only the mechanical considerations that affect the design of shops, but also the philosophical concepts which influenced design. A thorough reappraisal was made of vocational shop programs. Teachers studied the important social, human, and industrial factors which influence the ultimate goals of vocational education. Educational objectives were reexamined. Revisions of shop courses of study reflected the latest developments in industry and business. Teachers sought to lay out shops in a manner that would best facilitate the achievement of objectives.



Shoe repair shop



Painting and decorating

Throughout the planning project close collaboration with vocational directors and supervisors and board of education department heads was maintained. Specialists from various industries were invited to appraise the plans from a technical viewpoint. As a result of this two-year teacher planning program, Mr. Campbell was able to present to the architects a precise, detailed, carefully thought out plan for every shop, classroom, and administrative office in the school. The planning effort reflected the intelligence of many people. It synthesized the proved experience of the past with modern ideas; it allowed for the creative ability of teachers to share in the planning.

The Layout of the Buildings

Designed to accommodate 2300 boys and girls, the new Dunbar Vocational High School is built on a 12 acre site. Space is available for future expansion. The units comprising the school plant are all connected, and may be roughly divided into three divisions, namely:

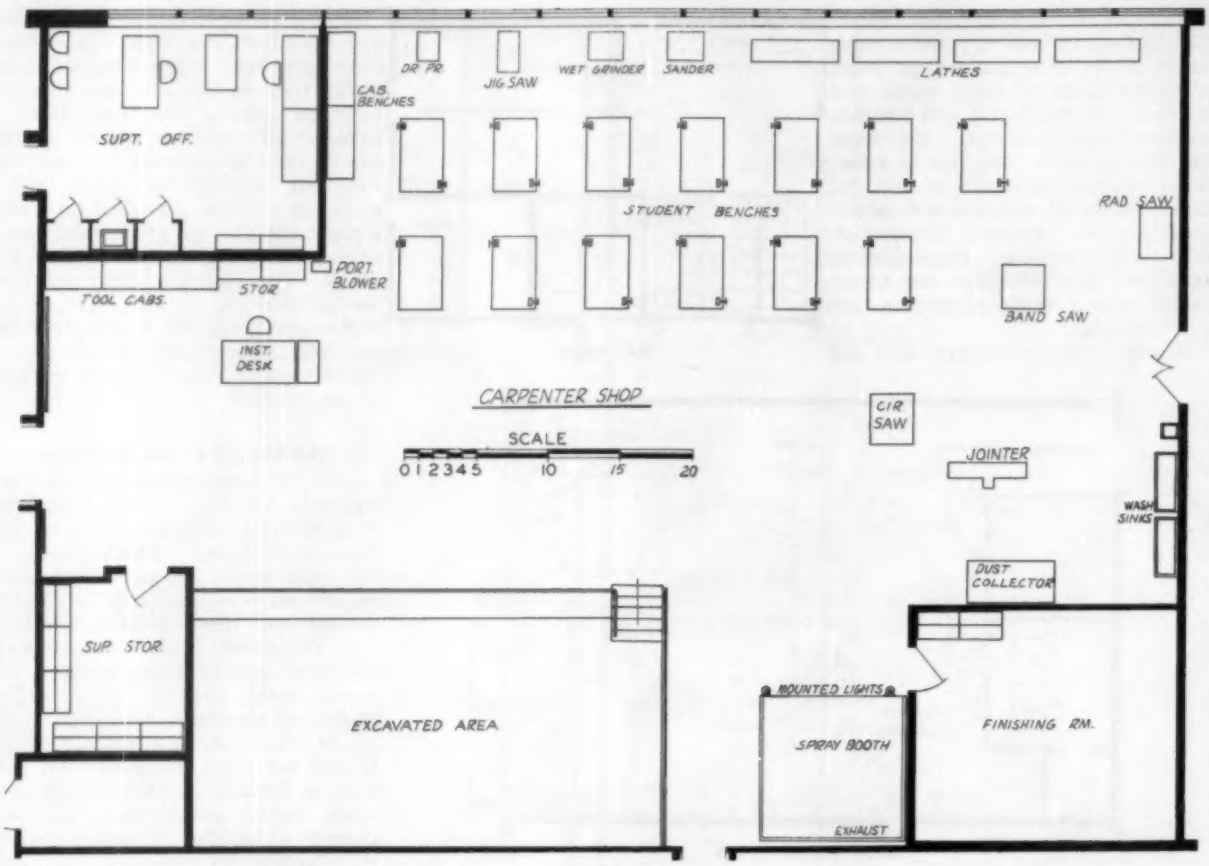
1. The South Wing — A one-story, industrial type structure contains the metal, wood, graphic arts, building trades, and electronic shops. This building in which 18 vocational shops are housed has many advantages. It permits an increase in unobstructed floor space, higher ceilings, and convenient delivery of supplies. It isolates and reduces undesirable shop noise, and minimizes safety hazards.

2. The West Wing — A three-story building houses the academic classrooms, laboratories, and the needlecraft, drafting, art, and cosmetology shops.

3. The North Wing — The administrative offices, guidance services, lunchroom, swimming pool, boys' and girls' gymnasiums, music department, and auditorium make up the North Wing. Business education classes, health rooms, and the library are on the second floor of this section. Separating the lunchroom from the administrative offices is a landscaped open courtway. This courtyard may be viewed through plate glass walls that extend from floor to ceiling of the surrounding corridors. It serves as a sound barrier between the lunchroom and administrative offices. The location and design of this courtway also assist in keeping student traffic along the administrative offices to a minimum.

Interesting Features of the Building

Would the arrangement of rooms and facilities make for a more effective educational program was the paramount problem to be solved. Would the administration of Dunbar's program be made easier through a functional design of facilities? Would the location of shops and



Carpenter shop

classrooms be convenient to students and teachers? Would student traffic flow without confusion? Would such traffic be minimized in areas of the school that demanded quietude? Aside from the functional aspects of the plans, recognition was given to the desirability of grouping classrooms and vocational departments in a manner that would permit students and staff to be in close relationship over a substantial part of the day's program.

The business education department is a typical example of this arrangement. Bookkeeping, typing, shorthand, and secretarial practice rooms are all connected, thereby permitting students of business education to go from room to room without entering the outside corridors.

The library is designed to function not only as a source of reading material and place of study, but also as a focal point where classroom groups, under teacher direction, may conduct research and discussions. The space allocated to the library unit is 40 by 107 ft. The main reading room has a seating capacity of 88 students plus two browsing areas which accommodate 10 additional students. A part of the library suite is a room where teachers may bring an entire class for special library work. A room for listening to the library's collection of tape recordings, records, and other audio aids; a conference room for small group conferences; and a workroom complete the library suite.

Communication, ever an important factor in school administration, is effectively accomplished through the latest electronic devices. A sound control room houses the audio equipment of the school sound system. Every shop and classroom is wired with loud-speakers. Radio broadcasts, tape recordings, announcements, or programs originating from various places, including the Director's office, may be broadcast over the public-address system.

A PAX (Private Automatic Exchange) telephone system connects all rooms and offices. A xylotone signal for calling administrative staff members is located throughout the corridors of the building and is operated and answered through any PAX telephone.

Twenty-four different rooms in the school contain wall outlets for hooking up television receivers. One central outside TV antenna serves these rooms. Wide use will be made of the educational contributions of television. Moreover, the school will make use of closed circuit television in support of its educational program.

The carpentry and plumbing shops have a unique treatment of floor space that provides additional ceiling height for shop projects. Sections of the floor areas are depressed. Within these sunken floor sections shop projects in carpentry and plumbing may be built which simulate two-story housing construction. The shoe rebuilding shop has a circular shop bench design that permits a number of student work stations to be viewed and reached by the instructor quickly and conveniently. The painting and decorating shop has a two-level arrangement of 12 open-end rooms which provide much needed wall space. The foundry contains a crucible gas furnace and a rocking type electric furnace. The journalism department is conveniently located near the printing shops. Equipment of the tailoring shops includes the latest type of machinery used in the garment industry, such as puffers, armhole, edge, and collar presses.

Space does not permit a detailed analysis of every shop layout in the school. The accompanying plans are for the automobile and aviation mechanics departments.

Aviation Shop

The aviation shop is designed for instruction in power plant mechanics, a course approved by the Civil Aeronautics Air Authority. The layout and equipment of this shop adhere to the regulations and specifications as outlined by the CAA. Approximately 8710 sq. ft. of floor space are utilized by the aviation department; this figure represents the combined areas of shop, adjacent classroom for related instruction, plus the test cell, tool, and equipment rooms. A division of work areas within the shop permits effective shop instruction on various levels. Basic engine overhaul, advance engine overhaul, engine parts, and cleaning, propellers, power machine and testing, electrical and carburetor and accessory areas comprise these divisions. The test cell, constructed of 18 in. reinforced concrete walls and ceiling, is fronted by a 12 foot rolling steel door that leads to a fenced-in outside enclosure. Two 3-ton Safeway Army type trolley hoists run on an overhead monorail permitting the transportation of heavy engine equipment to various parts of the shop. Five switches strategically located on the monorail allow the hoists to be moved to the test cell, storage area, and overhaul areas.

Adjacent to the shop is a classroom specifically designed for related technical instruction. Engines and other heavy equipment may be mounted over the instructor's desk for special lecture and demonstration purposes. Double raising type chalk boards provide twice the space for chalk board work; and wall mounted projection screen, blackout shades, and wall mounted speaker for sound projectors are features which permit effective showing of educational films.

Auto Body and Fender Shop

The auto body and fender shop occupies 4921 sq. ft. of floor space (74 by 66½ ft.). Along the length of the shop five 10 by 8 ft. doors provide convenient entrances to nine car stalls. Tool and equipment rooms, four in number, accommodate painting and welding tools, job parts storage, electrical equipment, and air operating equipment. This separation and compartmentalizing of tools enable students and instructors to work more effectively on various units of learning. A drying oven runs on an oven tract for the width of the shop, and at one end of this tract is located the automobile spray booth with adequate exhaust ducts. Four overhead air hose and electrical cord reels are located throughout the shop. A drain trench covered with a continuous metal grating runs the complete length of the shop room and also serves the automobile engine shop. A hydraulic twin post lift is a part of the permanent equipment.

The body and fender shop is separated from the automobile engine department by a concrete block wall. Doors in this wall permit easy passage between the two departments.

Automobile Mechanics Shop

An impressive feature of the auto mechanics shop is the ease with which automobiles may enter and leave. Six 10 by 8 ft. rolling overhead doors that open into the driveway make for effective intake and dispatch of cars. The total area including equipment rooms occupies 106 by 72½ ft. of floor space. Carburetor and ignition room, shop and brake equipment room, day school toolroom, and night school toolroom comprise the storage facilities. Two twin-post hydraulic lifts are provided, one in the lubrication area and the other for general repair work.

The spaciousness of the shop area and the layout of equipment enable students to participate in various units of instruction with efficiency. Eighteen floor vent exhaust boxes for individual cars are located throughout and keep the air free from exhaust fumes. Overhead electric power and air reels permit convenient and instant use of needed power and eliminate long clumsy lines of air hose and electric cords being strewed across the floor.

The new Dunbar Vocational High School represents the second building specifically designed for vocational education in Chicago. With the tremendous need for skilled workers in the industries and businesses of Chicagoland, Dunbar looks forward toward many years of valuable service to youth and adults.

Radio, TV, and Electronics Shop

JACK B. BROWN
Electronics Instructor
Alexander Hamilton High School
Los Angeles, Calif.

It was decided to abandon the metal shop and set up a modern radio, TV, and electronics shop. Our job was to start from the four walls outlining a space 35 feet by 40 feet and fit in this type of course. We started off by abandoning the concept that the unit shop should be limited to one type of activity. Neither the project method, nor the laboratory method, nor the demonstration method would, in themselves, constitute the only systems of instruction. But, recognizing the variables inherent in the types of students, the miraculous ever advancing nature of the subject field, and the changing needs of the community and its consumer problems, meant that a new approach to shop planning was called for.

Fundamentally, we based the plan on organized activity, since there seems to be no valid argument against Dewey's principle that we learn best by doing. Then we incorporated the laboratory function for the efficient learning of concepts and principles. A student doesn't have to build an electric motor to learn how it works and how to maintain it. This is best learned by the job card method where he answers basic questions from the references and hooks up, oils, and runs the various motors in a lab situation. Low voltage control systems, automobile horn, light and ignition circuits, house wiring, and basic radio and TV circuits are built up on work boards and mastered from the references, class instruction, hooking up,

Boys at work in the radio, TV, and electronics shop at Alexander Hamilton High School, Los Angeles, Calif.

operating and trouble-shooting doctored circuits.

The nature of the subject field is such that effects alone are capable of being demonstrated. We cannot see the electrons flowing in a wire. So, organized demonstrations of major areas of electricity such as magnetism, electromagnetism, heat, light, etc., are necessary parts of the shop plan. Communications, amateur radio, and Morse code instruction also must be provided for, if a large share of the modern student's interest is to be considered.

Radio and TV servicing is a significant area that requires an efficient instrument control plan. The test bench was decided upon and in practice has proved extremely flexible and economical to maintain.

Projects, the time-honored mainstay of industrial arts, still casts a magic spell on boys of all ages and must form a large segment of the shop plan.

With these major activities as goals, we made a model of the shop, the cabinets, benches, desks, and machines. We arranged and rearranged the units and became increasingly aware of the large limitation — the four walls. If we only had four more feet here, two more feet there, if the door were here, the windows there, etc., how much better it would be. The final plan was necessarily a compromise, but has proved very effective in a year of use. Looking back, now, there is remarkably little we would change, if we could, although we are constantly modifying, adapting, and adding to incorporate newer practices and procedures.

The course itself is a culmination of twelve years of experience plus ideas acquired from countless other teachers, gleaned from the literature, visitations, institutes, and supervisors. It is reviewed and altered continuously to keep it, and the instructor, out of the rut.

In each level of the course, the student keeps a notebook. In the front of the notebook is a mimeographed grade sheet listing all the job cards and projects. The grade sheet also has spaces for weekly notebook grades and Morse code and test grades. On Monday of each week the major concepts are demonstrated, with student help wherever possible, and an outline is developed on the chalkboard. Working models, visual aids and films are used extensively. For a *C* notebook grade the student makes a neat copy of the outline. For a *B* he fills in the outline with notes from the demonstration and discussions, for an *A* he adds, from outside references, amplified material on the principles and applications of the topic. The notebook is checked and corrected each Friday and the grade recorded so that he knows constantly how he is doing. The final notebook grade is the average of his weekly grades plus consideration of the overall appearance and corrections made.

The job cards relate to the broad areas and emphasize specific doing units. After a student does one, the instructor checks it and asks a few key questions to test for understanding, both of the principles and the techniques. The mark is recorded on his grade sheet and on the class progress chart. The student may then instruct another student in that job and when the learner is marked, the student instructor receives extra credit. Many boys have commented on the truism that teaching others is a good way of learning.

Short objective tests are used each Friday to check both the learning and the teaching from a meaning of words standpoint.

When the student has completed the basic job cards, he may select a project within his capabilities but must explain his reasons for selecting it, what he plans to use it for, and how it works. He then diagrams it, lists material, costs and steps of construction. He may not start it until he has all his parts. The student may elect, and many of them do, to continue with the job cards, specializing in any of the allied fields such as, house wiring, radio, electronics, amateur radio, etc. Points for projects and job cards are arranged so that the

A view of the radio, TV, and electronics shop

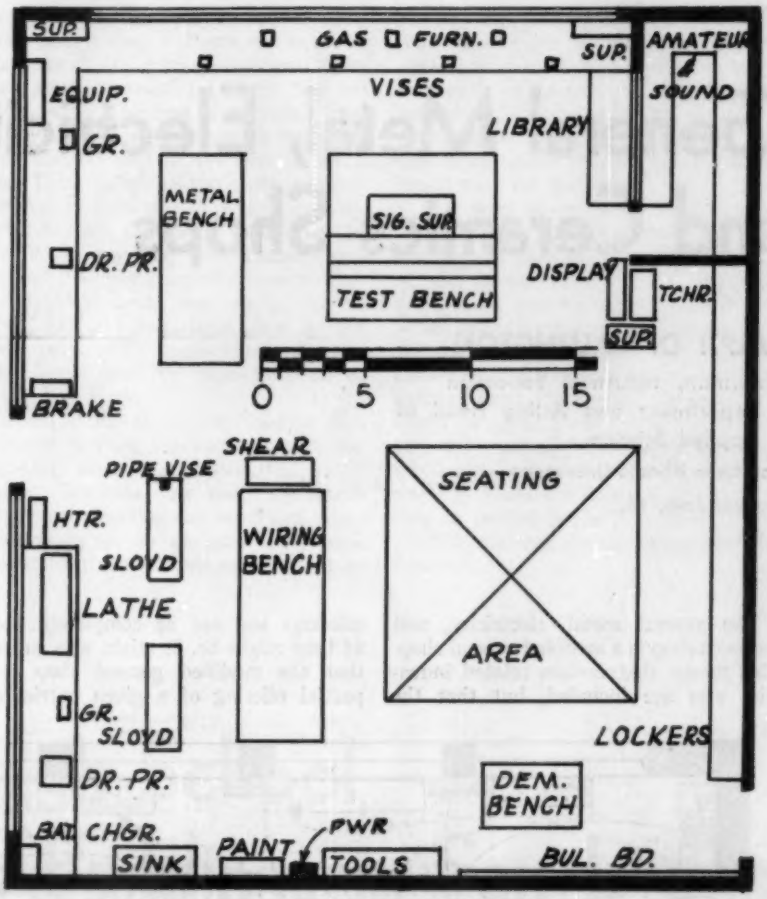
superior student can make an *A* either way.

The Morse Code is taught, using the five-letter code groupings, by starting with the E, I, S, H, 5 group and adding a five-letter group each week. When the tardy bell rings we start sending ten 5 letter words. These are corrected and entered on a progress chart. From the chart we govern our sending speed and can spot those who need help. When the student passes five words per minute, he is encouraged to go for his novice license and he continues on the automatic tape machine to increase his speed. This code lesson takes but five minutes daily and is helpful in getting the class started efficiently and keys them to listen carefully to instructions. Since we send carefully enough so that even the slowest student achieves 80 per cent, and the last of the ten words is sent fast, the fastest student is still challenged, it creates an atmosphere of challenge and success which has a wholesome effect throughout the period.

Shop organization under an elected foreman has proved successful in keeping the shop clean, tools, meters, books, and equipment checked and under control. It also teaches responsibility and provides for leadership training. This system, as well as the use of student ideas and craftsmanship in developing new work boards and visual aids, creates a feeling of interest and concern for the physical features of the shop and has reduced to a minimum the careless attitude which results in defacing and misuse of school property.

The advanced students, after doing the basic job cards at their levels, generally branch out into projects of an experimental nature such as electronic brains, lie detectors, remote control devices, or high fidelity equipment. Others may specialize in servicing radios or TV sets. Still others may choose to enroll in the sound crew which builds, operates, and maintains the vast network of public-address equipment the modern high school requires.

In looking back upon the countless experiences that have influenced the creation of this shop, one can only reflect upon the truth of the adage, "The proof of the pudding is in the eating." All this planning, work, and expenditure of money would be for nought if it did not help youngsters to acquire a more effective citizenship. The correspondence and visitations we've had from former students has undoubtedly had a large effect on course and content. Many who have followed graduation with vocations in these fields or have entered the armed services in these branches have remarked on the effectiveness (or lack of it) of the learning they experienced under this system. The relatively large percentage who have gone into electronics as a career speaks well for the establishment of a full course in industrial-arts electronics in the high schools. This is especially true in the areas where vocational training has been moved up into the junior college, which is still beyond the reach of many students. But, whatever field the student will enter, both as a consumer and a producer, he cannot help but be influenced by the surroundings and content of a sound, live shop program.



Shop layout of the radio, TV, and electronics shop at Alexander Hamilton High School

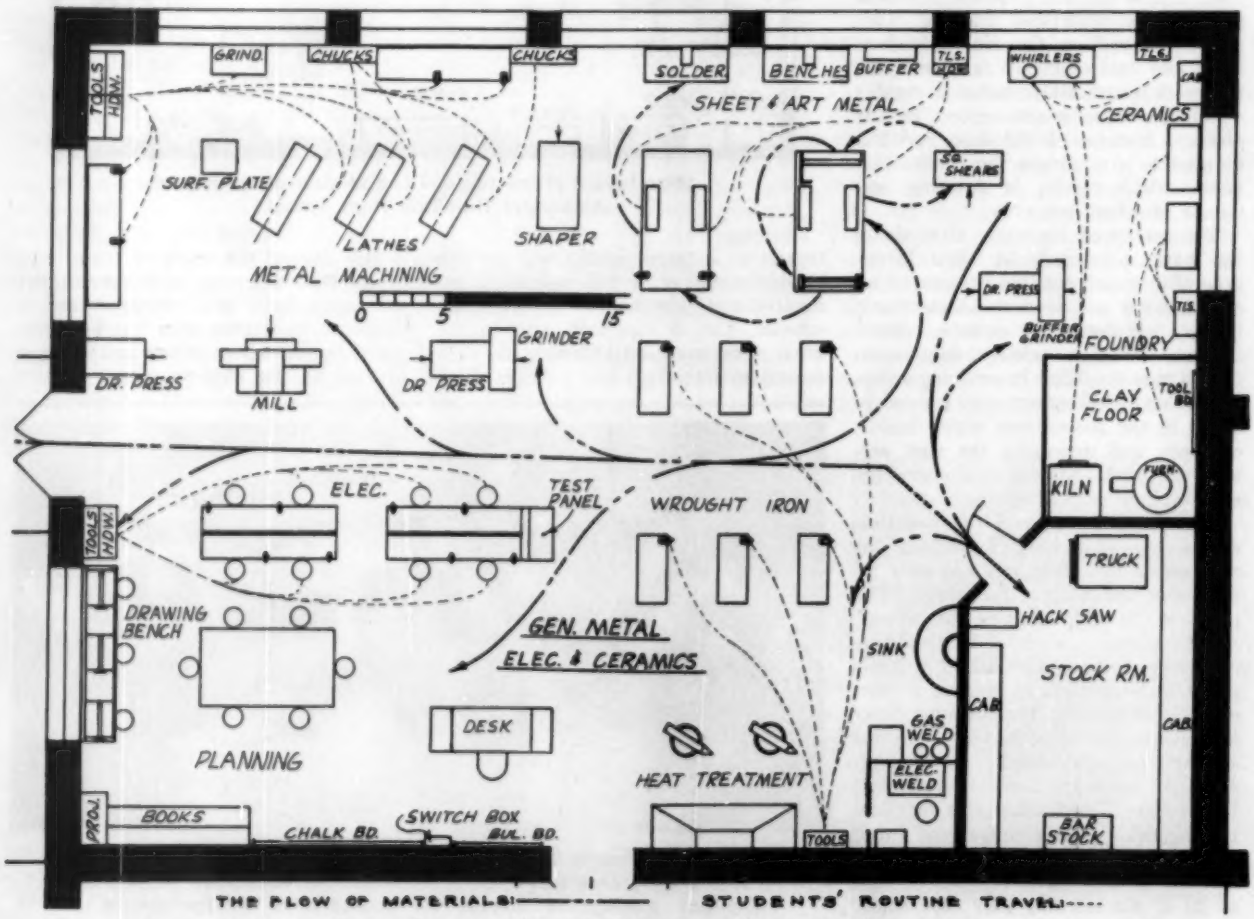
Industry representatives responsible for their individual company training programs meet with the curriculum committee of Western Michigan College to discuss the co-operative college course in petroleum distribution, a new course offered at Western Michigan for the first time in Fall, 1956

General Metal, Electricity, and Ceramics Shops

RALPH O. GALLINGTON
Chairman, Industrial Education Department and Acting Head of Applied Science
Southern Illinois University
Carbondale, Ill.

The general metal, electricity, and ceramics shop is a *modified* general shop. This means that certain related industrial arts are included, but that the offerings are not as completely basic as they might be. It might also suggest that the modified general shop is a partial offering of a given curriculum which includes a wide basic coverage of industrial arts, the other offerings being provided by other *modified* general shops. In this presentation, this meaning and suggestion are assumed.

First an explanation of the relationships between the offering seems in order. It will be granted that foundry is a part of a general metals offering, but why include ceramics in this modified shop? This question has been considered carefully in light of the physical requirements and the need for a broader industrial arts. Both ceramics and foundry require extreme temperatures, but the same furnace or kiln cannot be



Layout for general metal, electricity, and ceramics shops

used for both. There are, however, many other relationships which make for high compatibility. Both require damp storage cabinets. The kiln can be used for baking cores used in foundry. Each complement the other in the making of special molds. The kiln and furnace are easily located close together and on the same type of floor, occupying the least possible amount of space.

The electrical working area depends greatly on the metalworking machines, and materials. Also ceramic parts can be made as insulators for electrical projects of all kinds. Wire is the heart of electrical construction and it is a metal. Laminated cores, metal frames, welded parts, sheet-metal covers, copper and brass contacts, special binding posts, asbestos, and ceramic insulators are all products worked best in this shop.

Outside loading doors provide a convenience seldom realized in similar shops. A wide aisle leading to the stock room provides ample space for receiving stock and storing it. Some of the sheet-metal stock could be stored best under the tables provided for sheet and art metal work. The flow of materials lines on the accompanying drawing show this procedure as well as the flow of stock from these tables to the various sheet-metal work stations.

Stock from the stock room may be moved to any one instructional area without disrupting activity in any other instructional area. Bar stock may be sawed on a power hack saw in the stock room. This keeps down unnecessary travel and the transportation of heavy bar stock.

In all of the shops described by this series of articles, teachers may use the planning areas for instructing small groups. Students may use these areas for project planning and reporting. Also, these shop are so designed that each instructional unit is self-sufficient in so far as tools and supplies are concerned. This makes for a better foremanship organization of management. The teacher's desk is located in a spot easily accessible to all students. In all of these shops, the teacher has ample desk and filing space as well as a bulletin board near the entrance.

The shop is provided with a book and magazine storage as well as a project file for student use. It makes use of the darker areas of the room for appropriate activities. For example, furnaces, heat treating, and welding occupy the darker areas of this shop. Each of these activities represented requires little natural light. The rules generally followed in using darker areas of a shop are, (1) place activities in darker areas when little natural light is required, and (2) place activities of short duration in darker areas, providing ample artificial lighting for the temporary use involved.

New Junior High School Industrial Arts Buildings in San Diego

WILLIAM B. STEINBERG
Supervisor of Industrial Arts
San Diego City Schools
San Diego, Calif.*

The public schools in San Diego are experiencing the same problems, as a result of rapid growth, that seem characteristic of school systems throughout the nation. The enrollment in San Diego City Schools has increased from 50,000 in 1950 to 80,000 in 1956. It is estimated that the enrollment will be 100,000 in 1960. With the increase in the number of students, there is a need for many new school buildings.

Two of the new secondary schools recently built are Marston Junior High School and Gompers Junior High School. Although designed by different architects, each was planned to accommodate 1500 students and to provide for the same educational needs.

*Photographs by San Diego City Schools.

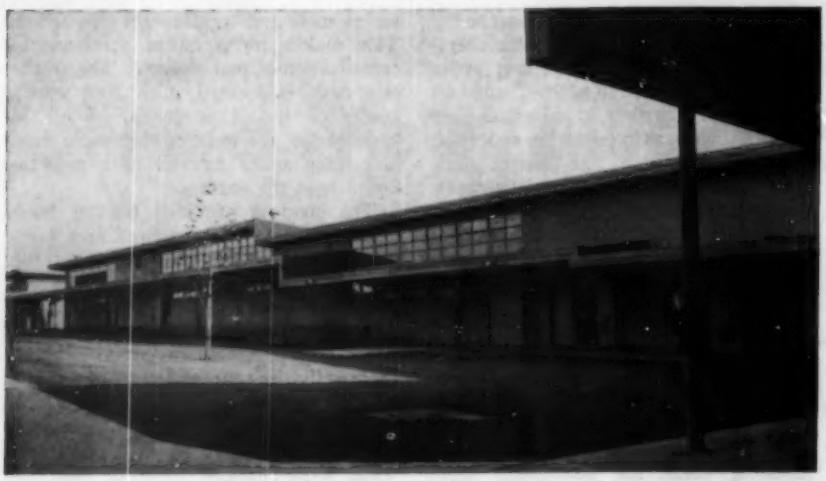
The industrial-arts department in each of these two schools has five shops: a comprehensive general shop, a graphic arts shop, a woodshop, a general metal shop, and an electric-radio shop. Each shop was designed for a class of 30 students. A standardized equipment list that was developed by local industrial-arts teachers has been used to allocate tools and machines for each of the shops.

The Seventh Grade Program

All seventh grade boys in the San Diego City Schools are required to take industrial arts both semesters. The two basic courses for seventh graders are woodworking and industrial drawing. The comprehensive general shop has facilities to handle the two programs, as well as some handicrafts. Because it has the necessary space and equipment, this shop makes it possible for the students to stay in the same room with the same industrial-arts teacher for the entire school year.

In a school with an enrollment of 1500 students there will be approximately 250 boys in the seventh grade. This means that by using the general shop five periods per day, 150 boys can be accommodated, or for 6 periods, 180 boys can be accommodated. The remaining seventh graders must then be enrolled in the graphic-arts shop for one semester, and the woodshop for the other semester. These two shops provide approximately the same instructional program as that included in the general shop.

Probably the most unusual industrial arts shop in San Diego is the graphic-arts shop. This shop is designed to include activities in industrial drawing, photography, hand composition, letter press printing, silk screen printing, and linoleum block printing. Therefore, the seventh graders who have been unable



The exterior of the Industrial Arts Building at Marston Junior High School

to enroll in the general shop receive one semester of graphic arts with an emphasis in industrial drawing.

The Eighth Grade Program

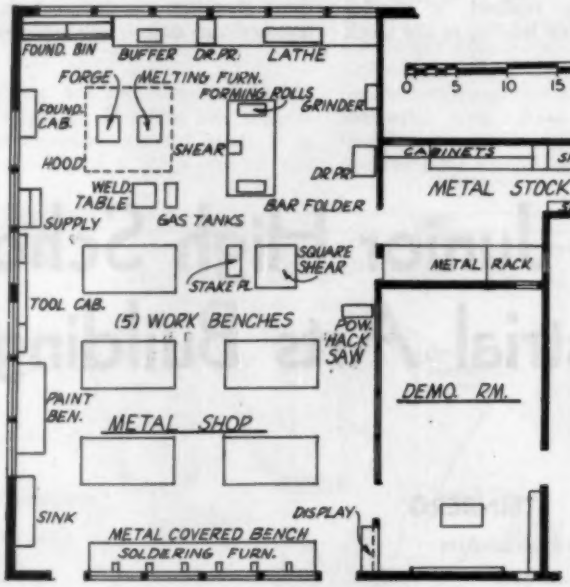
The city school system requires only one semester of industrial arts in the eighth grade; however, over 90 per cent of the boys elect a second shop. The usual program for the eighth grade includes a semester of general metal and a semester of electricity-radio.

The Ninth Grade Program

At the ninth grade, industrial arts becomes an elective, although a city schools' requirement for high school graduation for all boys is one year of industrial arts taken sometime between the ninth and twelfth grades. Approximately 80 per cent of the boys in the ninth grade enroll in industrial arts classes, and they may elect any one of the shops. Woodworking is the most popular shop at this grade level, with graphic arts, general metal, and electricity-radio placing second, third, and fourth in popularity.

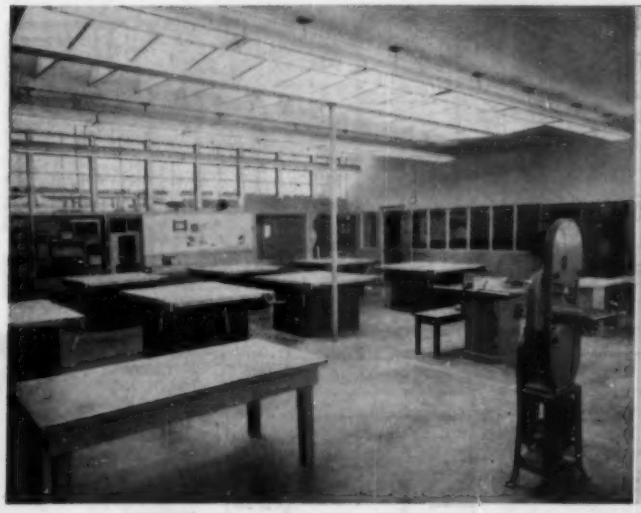
Single Story Buildings

The buildings at both of the new junior high schools are one-story structures with covered outside corridors. The exterior design of the industrial arts buildings is exactly the same as that of the rest of the school buildings. At Marston the five shops are housed in one long building. At Gompers two separate buildings are used. The interior of each shop was designed for specific activities. Before the shops were built and the equipment purchased, all of the facilities and shop layouts were reviewed by local industrial-arts teachers. Wherever possible, the suggestions of the teachers were included in the planning so that the shop facilities would be



Metal shop

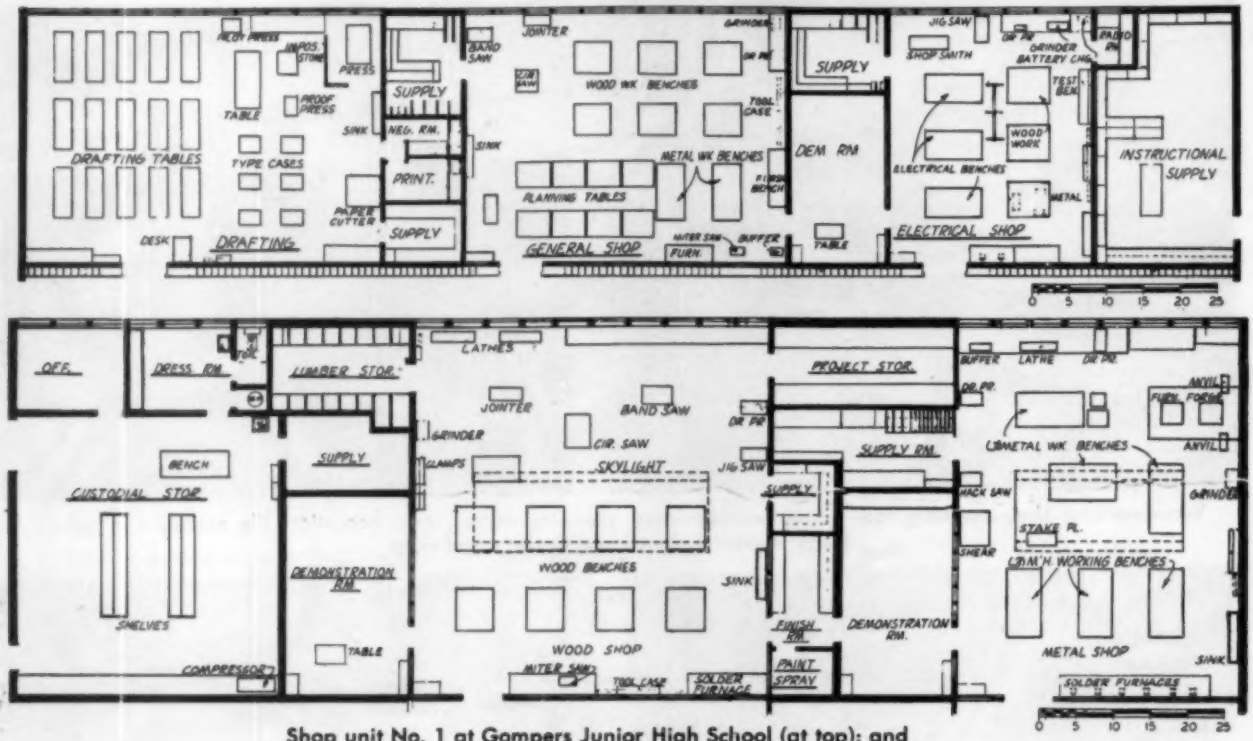
A display case is provided for each shop. At right — In each supply room a cabinet with small drawers is provided to store nails, screws, bolts, and small parts



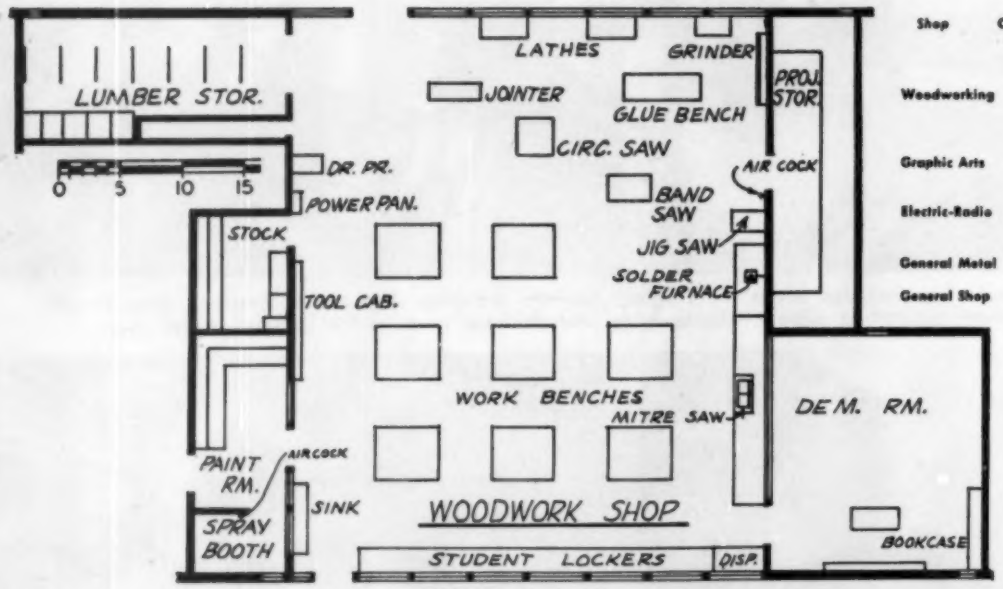
Woodworking shop showing tool panel, workbenches, planning center, and acoustical tile ceiling. At right – large student lockers used in the wood shop

The general metal shop includes areas for forging, foundry, welding, sheet metal, machine shop, bench metal, and art metal. At right – the forging and foundry area in the general metal shop

One of the photography dark rooms in the graphic arts shop. At right – the electric-radio shop has a glassed-in radio test room that can be easily supervised



Shop unit No. 1 at Gompers Junior High School (at top); and
Shop unit No. 2 (at bottom)



SHOP SIZE

Shop	Open Area (Sq. ft.)	Auxiliary Rooms (Sq. ft.)	
Woodworking	1850	Planning Center	350
		Finish Room	160
		Supply Room	65
		Project Storage	220
		Lumber Storage	190
Graphic Arts	1850	Supply	100
		Photo Darkrooms	140
Electric-Radio	1100	Supply	160
		Planning Center	340
		Radio Testing	50
General Metal	1525	Planning Center	340
		Supply	190
General Shop	1700	Supply	180

Wood shop

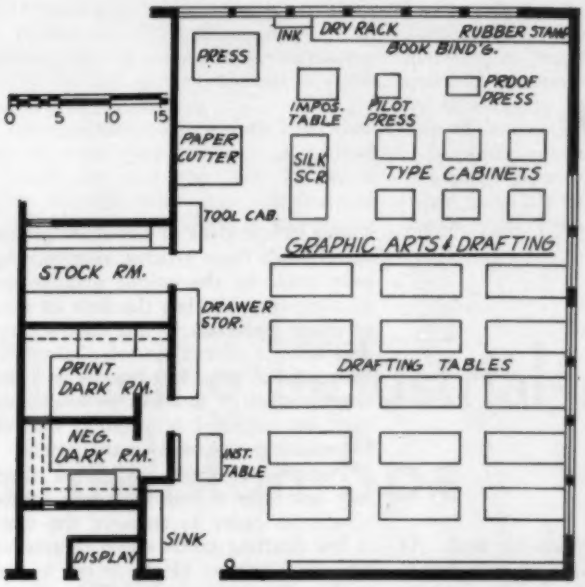
arranged in a manner that would improve teaching efficiency and student learning.

The Open Shop Area

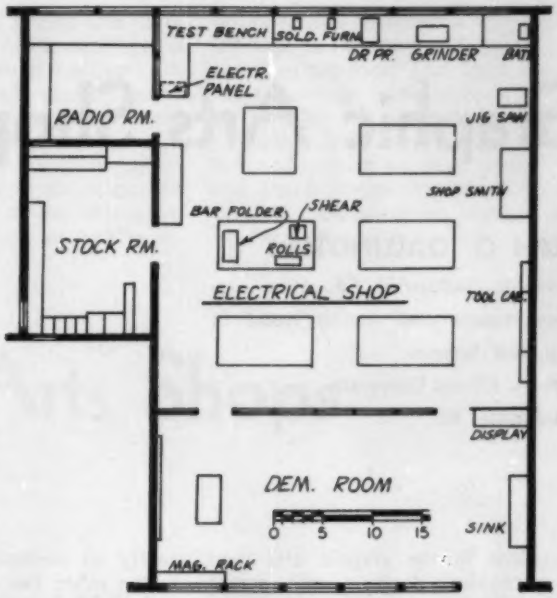
To reduce the noise in each shop, acoustical tile was used on the ceilings. All of the acoustically treated ceilings are 12 feet high. The open areas are either square or rectangular in shape, making it possible to see the entire room from any point in the shop. Every shop has a wash sink, and included at each sink is a drinking fountain. Open tool panels are used, and they have been centrally located so that students have easy access to them from any part of the room.

In the wood, metal, electric-radio, and general shops, display cases were built in so that projects could be readily displayed. All shops have tack boards and bulletin boards wherever wall space permits. In the school academic classrooms, asphalt tile was used on the floors. Colored cement floors have been installed in the open shop areas in all of the shops except the graphic arts shop, where asphalt tile is used.

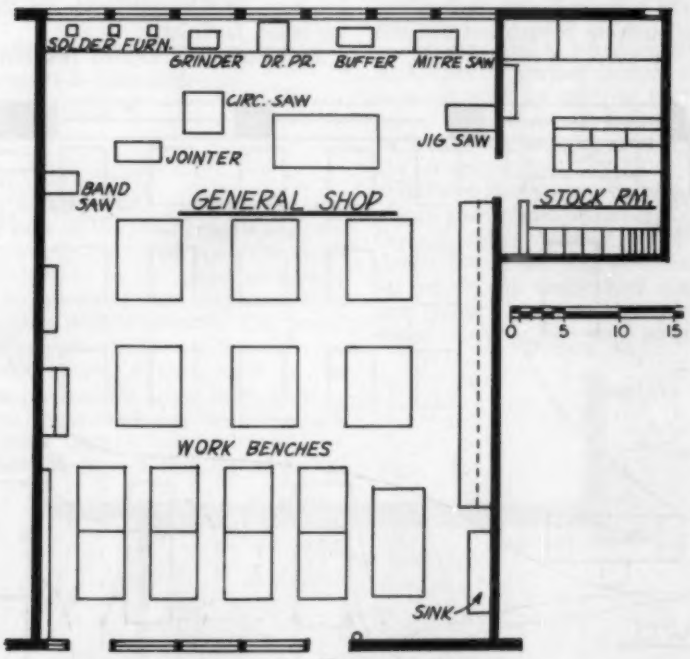
The storage of students' projects is



Graphic arts and drafting



Electrical shop



General shop, Marston Junior High School

always a problem, and every effort was made to provide as much space as possible for this purpose. All of the workbenches have lockers under them, and all of the wall benches also can be used for project storage.

Auxiliary Rooms

Since the study of products and processes of industry is an important part of the industrial arts instructional program, it is necessary to provide facilities for teaching this information. With this in mind, each shop has a seating area to be used for class discussion, demonstrations, and as a planning center. To provide for the use of audio-visual material, such as filmstrips and motion picture films, a glassed-in planning center that can be darkened was included in the woodworking, general metal, and electric-radio shops. Each demonstration room has a blackboard, bulletin board, bookcase, magazine rack, and a place to store drawing boards and drawing equipment. A space 14 by 24 ft. is adequate to house 30 students. Each of the planning centers has asphalt tile on the floor, as well as acoustical tile on the ceiling.

Each shop has a specially designed storage room to take care of necessary supplies. A dutch door was provided at the entrance to each of the supply rooms. This makes it possible to use students in the supply room to assist in distributing supplies.

In addition to the planning center and storage rooms included in each shop, other special auxiliary rooms were provided where necessary. The graphic arts room includes two darkrooms — one for negative developing and the other for making photographic prints. A special radio testing room is included in the electric-radio shop. The woodshop has a finishing room, a spray booth, and a student project storage room for partially assembled projects.

Planning for Safety

Safety instruction is an important part of the industrial-arts program. Every effort should be made to provide safety features in shop planning. A separate electrical power panel is provided for each shop. These panels are centrally located so that they can easily be reached from any point in the shop. Adequate space was provided around all power equipment, and operator safety zones were painted on the floor around all machines. In placing all equipment or benches, adequate aisle space was provided so that students can walk freely through the shop. Extreme care was used to have free access to storage and supply rooms.

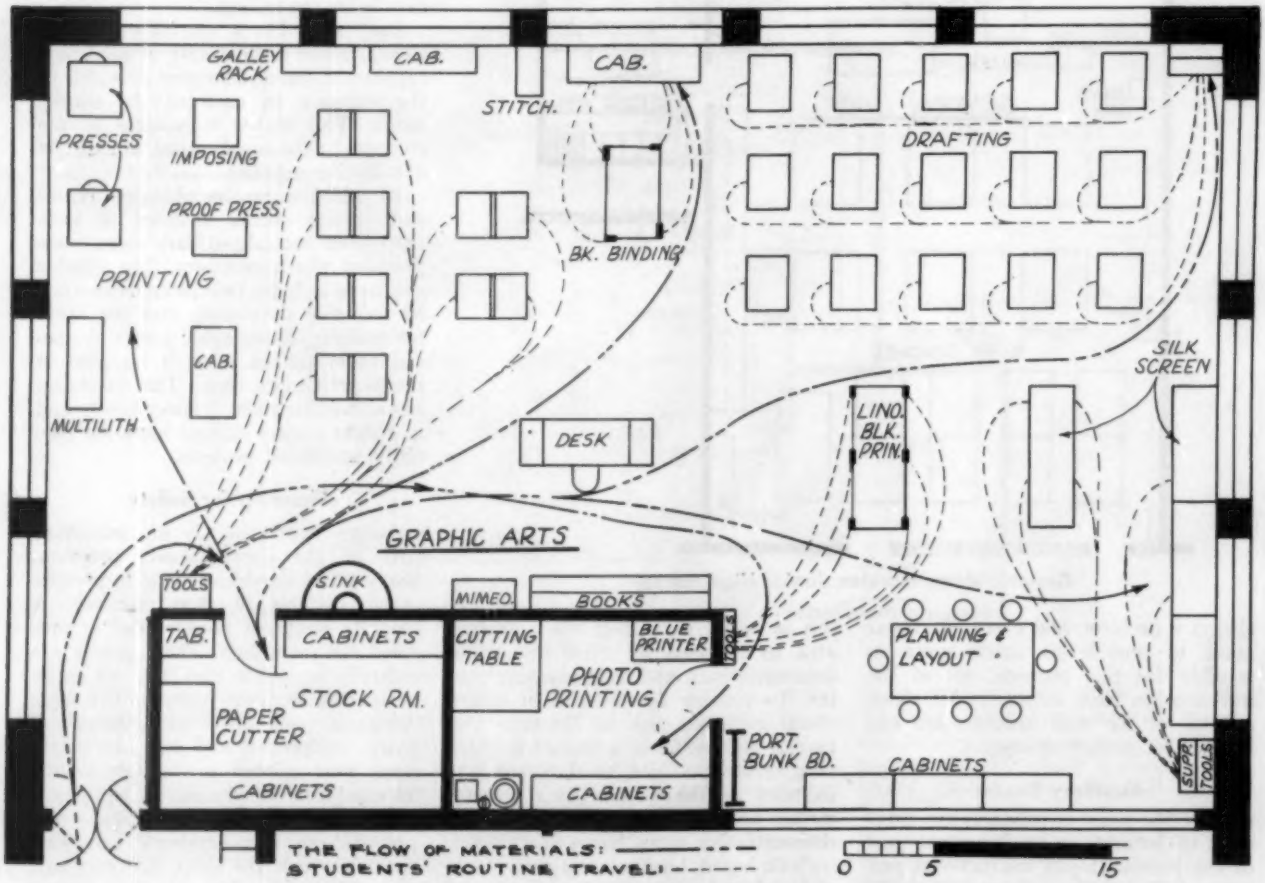
Graphic Arts Shop

RALPH O. GALLINGTON
Chairman, Industrial Education
Department and Acting Head of
Applied Science
Southern Illinois University
Carbondale, Ill.

Featured in the graphic arts shop are mechanical drafting, silk screen printing, linoleum block printing, bookbinding, mimeographing, multilith printing, letterpress printing, blueprinting, and other types of photoprinting. The shop areas are so located that the teacher has a commanding view of nearly all students from his desk. As in the other two shops of the junior-senior high industrial-arts wing, this is a limited general shop for 20–30 students, having only those activities which are closely associated with each other. Also, the students in each instructional area of the shop are able to work as a unit independent of the other groups. All through these articles, reference has been made to the unique arrangement of equipment so that the flow of stock or other materials to any instructional area will not affect the work of any other instructional area. The teacher will have a great deal of freedom by organizing each instructional unit group into the foremanship system of management.

Planning, linoleum block work, drafting, and silk screen work are located closely in order to enhance the work. A few drafting tables could be reserved for the linoleum block design as well as for silk screen design. The planning and layout table could be used for an overflow of design work, especially for large designs unsuitable for drafting-board facilities.

Bookbinding is located between the



Layout for the graphic arts shop

letterpress printing and the other areas of graphic arts. This seems quite logical, allowing for all groups to be accommodated by this service without a criss-crossing of travel lines.

Photoprinting could include blueprinting, positive type printing, as well as photography and the like. It seems quite feasible that shop instructional sheets could be processed in the photoprinting room of the graphic-arts shop. Furthermore, the use of the mimeograph machine, or liquid duplicator and the multilith machine might also be shared by all shop instructors in the preparation of instructional materials.

No outside entrance was provided for this shop. Since most of the stock and other materials used in the instruction are of small dimensions, an outside entrance seemed superfluous. However, the entrance to the stockroom is very near the shop entrance. This shop does not demand a large center aisle as is needed in the other two shops.

Student lockers are located in the hall and provide for most project storage. Also scattered throughout the shop are low cabinets which could be used for the light storage needed.

Planning Industrial-Arts Shops at Ballston Spa

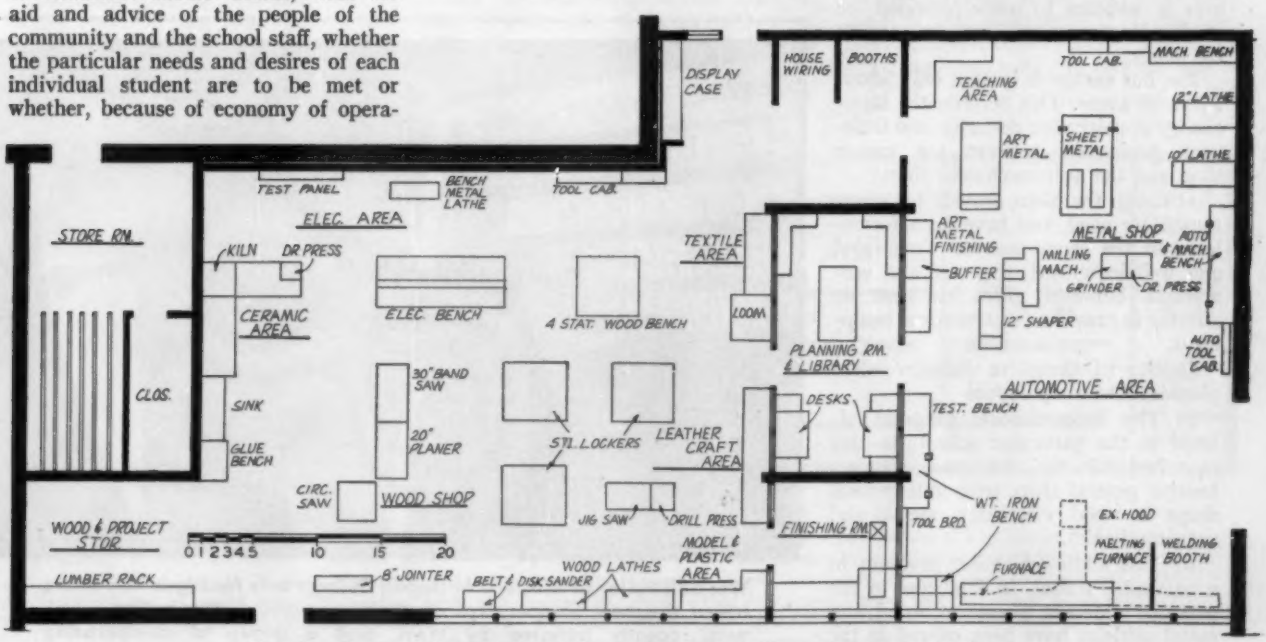
W. T. JONES
Superintendent and
JOSEPH FRUEHWIRTH
Industrial-Arts Instructor
Ballston Spa Central School
Ballston Spa, N. Y.

An industrial-arts program, like any other part of the total educational program, should be based upon the needs of the pupils to be served and upon the community's needs and its ability to support such a program. The board of education should decide, with the aid and advice of the people of the community and the school staff, whether the particular needs and desires of each individual student are to be met or whether, because of economy of operation, at least a certain number of students must have similar needs and desires before the building, equipment, and program will be made to provide for them.

For example, a board of education should decide whether individual lessons in music shall be paid for by the taxpayer, or whether such instruction shall be limited to classes of at least four, or five, or six pupils.

Ballston Spa is a community of 5000 people and is part of the Ballston Spa Central School District which serves about 2000 pupils, 825 of whom are in the junior and senior high schools. A new building to house both junior and senior high pupils was occupied in December, 1956. It is a residential and industrial area. Local industries manufacture knit socks and leather ware. A very large number of people from the area work for the General Electric Company in Schenectady, 15 miles from Ballston Spa.

The financial ability of Ballston Spa and the philosophy of the people, school staff, and the board limits organized instruction to group instruction, and the facilities and the program provides for only those areas in which there are several pupils to be served. For this reason, agriculture was not included in the program after a survey clearly showed that only a few pupils and their parents had an interest in this area.



The shop layout of the industrial-arts shops at Ballston Spa Central School

To serve the 825 pupils in the Ballston Spa junior-senior high school to be built, would require two industrial-arts shops. It was decided that because of special interests and abilities of instructors, it would provide better instruction to divide the fields of instruction between them. Therefore, the comprehensive general shop areas were divided between the two shops to coincide with the unit shop courses to be offered in each. General shop classes would shift from one shop to the other in order to get instruction in all fields offered.

Because the shops are noisy compared with many other school activities, they were located the farthest possible distance from academic instruction; but located near the auditorium stage to permit easy access for the construction of stage scenery and props. Both shops were provided with direct access to the outdoors, the auto mechanics and metal shop having a wide and high overhead door to permit bringing cars and other mechanical equipment into the shop.

For economy of space, for better supervision of pupils, and for easier cooperation of teachers and integration of their work, office space and a student planning center were enclosed in glass and located between the two shops.

A glass display case for finished projects and other objects of interest was provided at the entrance to the two shops.

A common wash area for the shops was provided at the exit point of each. Storage space for large projects, lumber, and little-used equipment and supplies was provided between the shops and over the office and student planning area in addition to space provided for storing lumber, metal, etc., in each of the shops.

The bus garage is located only about 75 yards away. This permits the interchange of costly but desirable and little-used equipment between the garage shop and the auto-mechanics shop.

Although the plans provide for every reasonable need, and have been formulated so the shops are very functional and well integrated, they are also economical. However, there has been no stinting in providing instructional equipment.

Outline of things to consider when planning the shop layout.

a) The industrial-arts program offered in the particular school. In this case 7th, 8th, and 9th grade comprehensive general shop, with unit general shops in wood, electricity, metal, and auto mechanics.

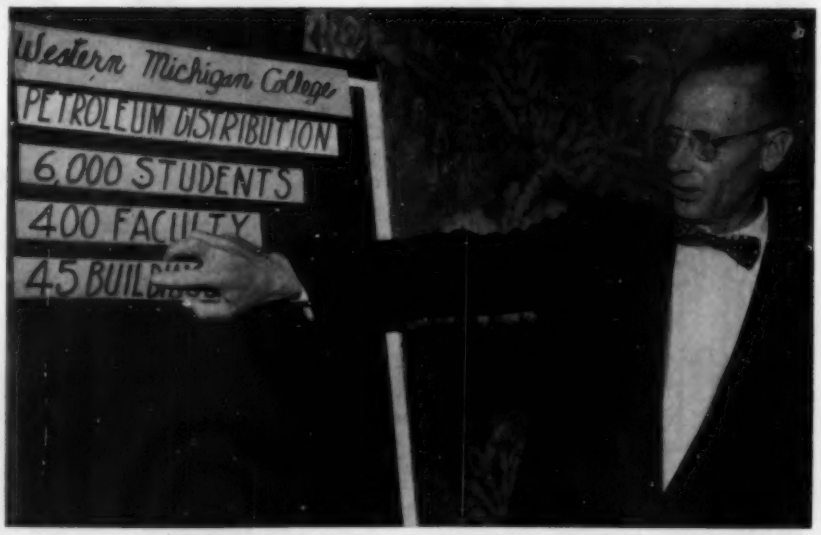
b) The adult education program in a particular school. In this case, in the past the different phases of wood and metal subjects have been offered in the adult education program. However, with more floor area and two shops it is reasonable to assume that such additional subjects as welding, machine shop, electricity, and ceramics will be in demand, and definitely should be considered when laying out a new shop.

c) Emphasis on unit general shops should be based on community and student needs. (1) Community needs would include the type of shop background in demand in local industry. (2) Student needs would include the type of shop experience that the majority of the students want or need.

d) In a school having two or more shops, but not large enough to have a comprehensive shop in use all the time, comprehensive shop activities should be equally distributed between the shops so as not to have to duplicate supplies, equipment, and instruction. In this case, one shop includes wood, electricity, ceramics, textiles, plastics, leather, crafts, and possibly printing for the comprehensive general shop program. The second shop includes art metal, sheet metal, wrought iron, hot metals, foundry, welding, metal machine work, and auto mechanics for comprehensive general shop. Here each instructor has about an equal number of units to teach. This is so set up that the 7th, 8th, and 9th grades comprehensive general shop classes spend an equal amount of time in each shop. In short, with the cooperation of the administration in scheduling of classes, each instructor starts out with an equal number of 7th, 8th, and 9th grade classes, and in the middle of the courses the pupils are interchanged between instructors. The fact that each instructor remains in his specific field and shop, and therefore is strictly responsible for the activities, equipment, and efficiency of that shop should tend to enrich the industrial-arts program.

e) During the process of laying out the shops and making out the specifications for equipment and machines to carry out the particular program efficiently, it may help if the general questions listed below are considered.

1. Is the floor area of the shop adequate to carry out your pupil load?
2. Is the equipment and machinery adequate for both the regular session instruction and the adult education program?
3. Is there adequate supply and project storage for both regular session classes and adult education classes?
4. Are there adequate project display areas?
5. Are all necessary safety and health precautions incorporated in the physical characteristics of both the shop and the equipment in it?
6. Is there adequate planning area in the shop?
7. Is there adequate area designated for instruction and demonstrations in the shop?
8. Is the location of equipment and machinery conducive to the best possible efficiency in the shop? (*a*) organization; (*b*) project production; (*c*) instruction and demonstration.
9. Does the shop layout somewhat parallel industry?
10. In two or more shops in the school, are the comprehensive shop activities equally and most efficiently grouped?



Wendall Fidler of Western Michigan College tells Michigan educators about the new co-operative course in petroleum distribution which was recently initiated by WMC and a group of co-operating industries in the petroleum field.

Community High School Shop

C. H. BERGMAN
Industrial Arts Department
Prairie High School
Cedar Rapids, Iowa

The erection of the shop building at the new Prairie High School is the first step in what we expect to be a very fine layout for general shop instruction. Prairie High, which is a new community high school, is located one mile south of Cedar Rapids, Iowa, a city of some 80,000 which is fast becoming Iowa's leading industrial city. At the present time only grades nine and ten are included, eleventh will be added for the 1957–58 school year and twelfth for the 1958–59 school year. The expected enrollment for the top four grades is approximately 500 to 600 students.

The shop building is located 100 ft. to the south of the main high school building. It is constructed of cement block, with the north side of face brick to match the high school building. Flat deck roof construction, with steel truss framing was used. The building is 32 ft. wide and 126 ft. long. Six sections of steel windows are located on each side of the building. Two main entries are located on the east side and on the south there is a large overhead rollaway door.

The walls of the corridor and classrooms are plywood paneling 4 ft., glass 4 ft., and the remainder to the ceiling paneling, giving the instructor vision of the entire area at all times.

The layout was designed with the idea that the woodworking area, I, would be used most at the start of the program and therefore a flow of materials can be set from the rear door along the entire east side to the workbenches, and to the finishing room. All woodworking machines are located in this area along the east side of the building. Other areas are electrical, II; home mechanics, III; sheet metal, IV; welding, V; machine metals, VI; and auto mechanics, VII.

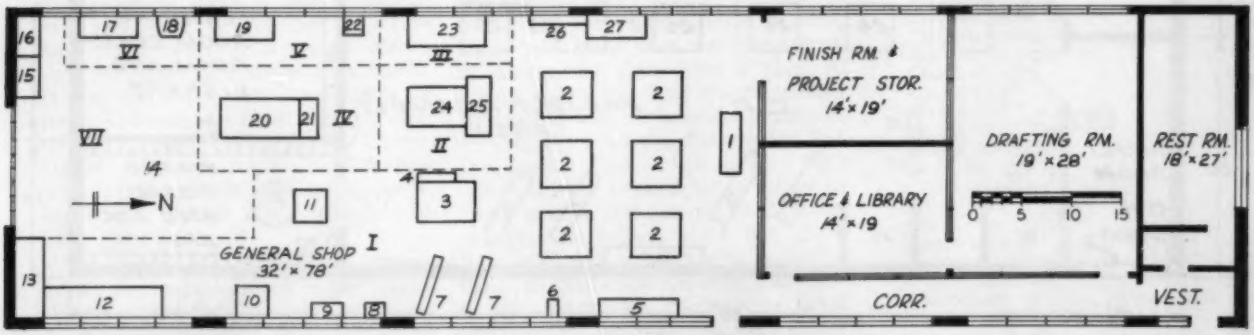
Adequate space is available at the south end for expansion at a future date when our space becomes limited by the number of students participating in the shop program.

Total dimensions of the building are 32 by 126 ft. Construction is of concrete block with one end having face brick matching the main building.

Room Dimensions

1. Rest room and cleanup room — 8 by 27 ft.
2. Drafting room — 19 by 28 ft.
3. Finish room and project storage — 14 by 19 ft.
4. Office and library — 14 by 19 ft.
5. General shopwork area — 32 by 78 ft.

The curriculum to be offered is as follows: drafting I, II, III; woodworking I, II, III; sheet metal I, II; machine shop I; electricity I; home mechanics I, II; auto mechanics I; and welding I.



Community High School Shop

Key to the diagram: 1. instructor demonstration bench; 2. 4-place woodworking bench; 3. layout bench; 4. 6-in jointer; 5. hand tool cabinet; 6. drill press 14 in.; 7. variable speed lathe; 8. band saw; 9. disk and belt sander; 10. radial arm saw 10 in.; 11. surfacer; 12. long stock storage; 13. short stock storage; 14. overhead hoist; 15. auto mechanics workbench; 16. auto mechanics test bench; 17. metal lathe; 18. metal lathe; 19. welding bench and furnace; 20. sheet metal bench, combination unit; 21. sheet metal machine; 22. pedestal type grinder; 23. home mechanics bench; 24. electricity workbench; 25. electricity test bench; 26. clamp rack; 27. glue rack. Tools for the various areas are to be kept in the particular area

An Experience in Co-operative Shop Planning

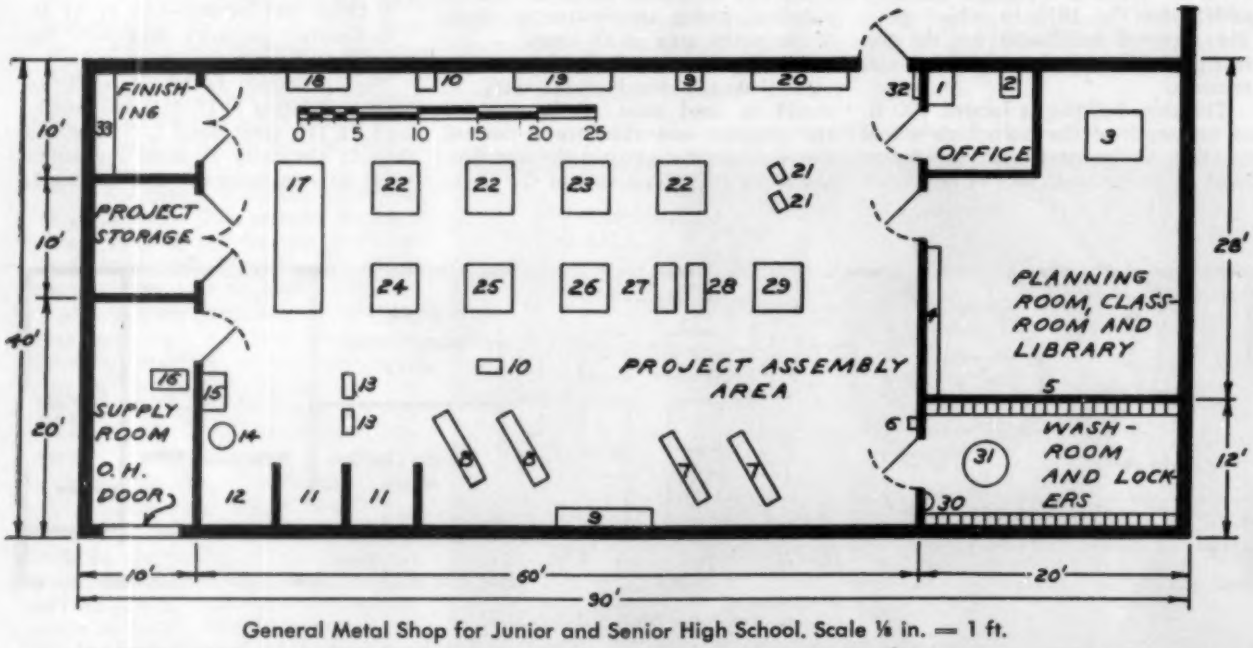
ROBERT D. BROWN
Industrial Arts Department
Long Beach State College
Long Beach, Calif.

Industrial-arts shops are provided in our public schools in order to bring about certain kinds of learnings which are less easily attained in conventional classrooms. The school shop provides a unique learning environment which achieves its uniqueness through the medium of careful planning.

The designing of industrial-arts facilities necessitates planning in many areas. Physical plants, for example, must be well planned as must the purchase of shop equipment, the arrangement of equipment, the use of color, lighting systems and systems of heating and ventilation. Intelligent original planning and continuous planning as the years pass are equally necessary.

It is possible to spend a great deal of money on a shop building and equipment without gaining facilities which are truly helpful in carrying on a good industrial-arts program. It is just as possible to spend much time and effort in developing a program only to have its productiveness limited by a poorly planned shop. The planning of facilities is the catalyst which insures that time and money spent will result in a program which contributes significantly to the educational development of its students.

Recognizing this, the industrial education department of the Utah State Agricultural College, Logan, Utah, has organized, and offers regularly, a course in school shop planning. The course is for industrial-arts teachers, administrators, supervisors, directors, architects, and others interested in planning new



General Metal Shop for Junior and Senior High School. Scale ⅛ in. = 1 ft.

1. Teacher's desk; 2. four-drawer filing cabinet; 3. drawing table; 4. shop library; 5. blackboard; 6. fire extinguisher; 7. metal-spinning lathe; 8. metal-turning lathe; 9. grinder; 10. floor model drill press; 11. acetylene welding unit, complete; 12. arc welding unit, complete; 13. anvil; 14. crucible furnace; 15. sandbox; 16. power hack saw; 17. soldering bench, complete with bench furnaces; 18. supply storage cabinet; 19. tool cabinet; 20. display case; 21. buffer; 22. 4 by 8-ft. workbench (storage underneath); 23. workbench, complete with stake plates; 24. shear; 25. cornice brake; 26. slip roll; 27. bar folder; 28. 24-in. box and pan brake; 29. scroll bender; 30. drinking fountain; 31. washroom and lockers; 32. control panel, all electrical circuits; 33. sinks

or remodeling existing facilities. A basic aim of the course is to familiarize its students with principles and practices of planning and equipping modern industrial arts and trade and industrial shops. The ultimate goal, of course, is the improvement of industrial-arts offerings in the schools of Utah and, very often, in the schools of other states.

During the first summer session of 1956, a group of twenty industrial-arts teachers met at Utah State as a shop planning class. The total number of years of successful teaching experience possessed by the group was impressive. Teachers representing most areas of industrial arts were enrolled. All were graduate students working on advanced degrees. Most importantly, all were keenly interested in industrial arts and in the designing of useful shop facilities.

The plan of attack followed by the class was a multiphased one. There were many lecture-discussion periods. Committees were organized. Reviews of available literature were carried on in Utah State's excellent library. Letters requesting information were sent to industrial firms. Tentative school-shop floor plans were laid out using wood models on a scale model floor. Drafting equipment was utilized for experimental purposes. Finally, the acceptable floor plans and a variety of informational reports were duplicated and bound together into copies of a shop planning manual which were distributed to members of the class.

As a professional contribution to the field of industrial arts, members of the shop planning class sought to develop ideas and to compile information which would be helpful in planning useful school shops, and further, to design a variety of shops which would be good places in which to teach and to learn.

Out of the work of the class came floor plans for shops in each industrial-arts area. One of the best of those floor plans is that of a general metals shop for junior and senior high school. It was developed by a committee of three. The members were: Angus Woodruf, Sacramento, Calif., Junior College; Daniel Wheatly, South Junior High School, Ogden, Utah; and Arlin Meecham, Irving Junior High School, Salt Lake City, Utah.

The committee's design for a general metals shop exhibits many of the best of modern school shop planning practices. A simple examination and analysis of the floor plan reveals the quality of thinking done by members of the committee.

The shop is at ground level and away from — but not isolated from — other school activities. Supplies are unloaded directly into the stockroom from a spacious driveway which runs off the city street.

As an aid to the teacher in maintaining physical control of classes, only one access door for students is provided. The overhead door in the stockroom is readily available as an emergency exit. All doors open *out* of the rooms they provide access to. For ease in handling and storing projects, the finishing and project storage rooms have double doors.

The shape of the main shop area is rectangular with a width-length ratio of 1:1.5. One hundred square feet of floor space (based on a class size of 24 pupils) are provided for each pupil. There are 37 separate work stations or about 25 per cent more than the maximum number of pupils who will use the shop at any one time.

A combination planning and drawing area and shop library is included as is a well-equipped teacher's office.

The power hack saw is permanently located in the stockroom so that bulky, and often heavy, pieces of stock need not be carried about the shop. Other machines, benches, and pieces of equipment are similarly arranged to facilitate the flow of materials (from raw material to finished product) and the flow of students through the shop. Equipment is also grouped with respect to sequence of operations. Tool cabinets are centrally located, and a large project assembly area is provided.

All in all, it is very apparently the kind of shop in which both teacher and pupils can enjoy and profit from their experiences. There are, however, many features of the shop which cannot be shown on the floor plan. They, too, help it to achieve uniqueness. It is sufficient to cite only a few as indications of the thoroughness of the planners.

The walls between the finishing room and main shop area, the walls between the teacher's office and all surrounding areas, and those between the planning room and main shop are constructed of transparent glass from a point 42 inches above the floor to the ceiling. All interior wall surfaces are faced with ceramic tile from the floor to the five-foot point. Above that point. walls which are not constructed of glass are faced with a durable sound-absorbing plaster. The ceiling is 14 feet above floor level and is faced with acoustical tile. The floors are concrete, and there are no supporting columns to break shop areas into hard-to-use spaces. Walls and ceilings, as well as tools, machines and equipment, are painted in accordance with the Pittsburgh system.

In order to utilize natural light to the greatest extent possible, the north wall of the main shop area is constructed of glass from a point seven feet above the floor to the ceiling. Fifty per cent of the north wall, or about one sixth of the total floor area of the main shop, is glass. Lighting fixtures which make use of slim-line fluorescent tubes are used to supplement natural light and to insure a steady 50 foot-candles of illumination on working surfaces in the planning room, 30 foot-candles in the main shop area and in the finishing room and office and ten foot-candles in locker and storage areas. Arc-proof light fixtures and switches are installed in the finishing room.

A mechanical exhaust system cleans the air in the finishing room and removes fumes from welding and foundry areas.

The finishing room is equipped with porcelain sinks, extra-large drains and stainless steel counter tops.

The wisely planned shop is one in which flexibility is inherent and in which changes are made easily and naturally as the needs of society change. In the general metals shop designed by the Utah State committee such features as unit-type machinery and the use of nonload-bearing partitions contribute greatly to the shop's possibilities for future usefulness.

Finally, knowing that sound shop planning involves planning for the purchase of tools, materials and supplies, the committee compiled a listing of the items needed in carrying on an effective industrial-arts program of general metals work.

SUGGESTED TOOLS FOR A GENERAL METALS SHOP

Tool	*Quantity*
Awl, scratch	12
Bellows, molder's, 10″	1
Bench plate, 8 x 30″, Stake holding	2
Blackboard set	1
Blowtorch, alcohol	1
Brush, bench	10
Brush, draftsman	4
Calipers, inside, 8″	2
Calipers, outside, 8″	2
Can, oil, ½ pint	2
Clamp, C, 4″	4
Clamp, C, 6″	4
Clamp, C, 8″	4
Clamp, C, 12″	4
Clamp, toolmaker's, 3″	2
Card, file, 1½ x 5″	3
Chisel, chasing	1
Chisel, cold, ¾″, bit	4
Chisel, cold, ½″, bit	2
Chisel, cold, ¼″, bit	2
Copper, soldering, 1 lb.	2
Copper, soldering, 2 lb.	2
Countersink, ⅜″, dia., round shank	2
Creaser, metal, single edge	1
Cut, cold, 1½″	1
Cutter, bolt, No. 0, 18″	1
Cutter, pipe, ⅛ to 1¼″, heavy duty	1
Cutter, paper	1
Die, ⅛″, tool set	1
Dividers, 6″, spring	2
Dividers, 10″, wing	2

(Continued on page 80)

GENERAL METALS SHOP SUPPLY LIST

Item	*Specification*	*Unit*	*Quantity*
Belt Dressing	Dixons	bar	1
Bolts & Washers:			
Carriage	¼ x 2½, ¼ x 3	ea.	100 ea. size
Wrought Washers	⅜", ¼", ½"	ea.	100 ea. size
Wing Nuts	¼", ⅜"	ea.	100 ea. size
Stove Bolts with Nuts	¼ x 1", ¼ x 1½", ¼ x 2", ¼ x 3"	ea.	100 ea. size
Brush Cleaner	Liquid	gal.	1
Brush, White Bristle, Flat	Nos. 4, 6	ea.	6 ea. size
Brush, Water Color	Nos. 1, 2, 3, 4, 5, 6	ea.	6 ea. size
Casting Sand	....	lb.	100
Chalk	Asstd. Colors	box	1
Chalk	White	box	1
Chemicals:			
Copper Sulphate	....	lb.	1
Hydrochloric Acid	....	gal.	1
Nitric Acid	....	gal.	1
Potassium Sulfide	....	lb.	1
Sulfuric Acid	....	gal.	2
Cloth, Wiping	....	lb.	100
Compounds, Polishing:			
Rouge	....	lb.	3
Tripoli	....	lb.	5
Copper, soft	24 x 96"–32 oz.	sheet	1
Copper, soft	24 x 96"–24 oz.	sheet	2
Copper, soft	24 x 96"–16 oz.	sheet	3
Copper Tubing:			
Rigid	⅛"	ft.	50
Rigid	¼", ⅜", ½", ⅝"	ft.	60 ea. size
Cotter Keys	....	100/box	10
Crocus	....	sheet	50
Drawing Ink, Waterproof	Higgins	bottle	3
Drawing Paper:			
White	9 x 12", 18 x 24", 24 x 36"	60 lb. ream	4 ea. size
Emery Cloth	1, 1/2, 0, 2/0, 3/0	sheet	50 ea. size
Escutcheon Pins, Brass	¼", ⅜", ½"	lb.	¼ ea. size
Finishing Supplies:			
Asphaltum Varnish	....	pt.	1
Hard Felt	8 x 1"	ea.	12
Muslin Polishing Wheels	30 ply., 8" dia.	ea.	12
Muslin Polishing Wheels	30 ply., 12" dia.	ea.	12
Suede tex	Asstd. Colors	1 lb./bag	13
Undercoat Adhesive	....	gal.	1
Fire Extinguisher	Carbon-tet	ea.	1
Fire Extinguisher	Soda Acid	ea.	1

Item	*Specification*	*Unit*	*Quantity*
Flux, Brazing & Welding	....	lb.	10
Galvanized Iron	36 x 120"— 26 ga.	sheet	3
Galvanized Iron	36 x 120"— 24 ga.	sheet	8
Glue	Rubber Cement	qt.	1
Glue	Weldwood	qt.	1
Lubricants:			
Lub Oil	SAE 10, 30	gal.	1 ea.
Cutting Oil	....	gal.	1
Cup Grease	....	lb.	1
Metal:			
Aluminum, Angle	½ x ½ x 1/16"	ft.	60
Aluminum, Angle	¾ x ¾ x 1/16"	ft.	60
Aluminum, Angle	1 x 1 x 1/16"	ft.	60
Aluminum, Angle	¾ x ¾ x ⅛"	ft.	60
Aluminum, Angle	1 x 1 x ⅛"	ft.	60
Metal Supplies:			
Asstd. Jeweler's Findings	Brass	gross	1
Angle Iron	⅛ x 1 x 1"	ft.	100
Angle Iron	⅛ x 1½ x 1½"	ft.	100
Angle Iron	⅛ x 2 x 2"	ft.	100
Angle Iron	3/16 x 1½ x 1½"	ft.	100
Band Iron, Mild	⅛ x ⅜"	ft.	400
Band Iron, Mild	⅛ x ½"	ft.	400
Band Iron, Mild	⅛ x ¾"	ft.	400
Band Iron, Mild	3/16 x ⅜"	ft.	200
Band Iron, Mild	3/16 x ½"	ft.	200
Band Iron, Mild	3/16 x ¾"	ft.	200
Band Iron, Mild	¼ x ⅜"	ft.	100
Band Iron, Mild	¼ x ½"	ft.	100
Band Iron, Mild	¼ x ¾"	ft.	100
Ingot	Aluminum	lb.	100
Ingot	Pig Lead	lb.	100
Mild Steel, Round	3/16", 1"	ft.	100 ea. size
Mild Steel, Round	¼"	ft.	400
Mild Steel, Round	⅛", ½", ⅝", ¾"	ft.	200 ea. size
Mild Steel, Square	¼ x ¼"	ft.	200
Mild Steel, Square	½ x ½"	ft.	200
Mild Steel, Square	¾ x ¾"	ft.	200
Rods, Round Stock:			
Aluminum	¼", ⅜" dia.	ft.	60 ea. size
Brass	¼", ⅜" dia.	ft.	60 ea. size
Copper	¼", ⅜" dia.	ft.	60 ea. size
Sheets			
Aluminum, half-hard	48 x 96 B&S 24	sheet	4
Aluminum, half-hard	48 x 96 B&S 20	sheet	1

Item	Specification	Unit	Quantity
Metal Supplies:			
Sheets:			
Brass, half-hard	12 x 96 B&S 26	sheet	1
Brass, half-hard	12 x 96 B&S 24	sheet	1
Brass, half-hard	12 x 96 B&S 22	sheet	1
Brass, half-hard	12 x 96 B&S 20	sheet	1
Sheet Steel, Scrap	Asstd. Gauges	lb.	500
Tool Steel, Octagonal	⅜", ½"	ft.	50 ea. size
Tool Steel, Octagonal	¾"	ft.	100
Nails:			
Finishing	2d, 4d, 6d, 8d	lb.	1 ea. size
Common	2d, 4d, 6d	lb.	1 ea. size
Common	8d	lb.	2
Brads	¼"— 20, ½"— 16, ¾"— 18	lb.	1 ea. size
Painting Supplies:			
Art Metal Enameling			
Glazes	Asstd. Colors	oz.	2 oz. ea. color
Aluminum Paint	....	qt.	1
Brush, Varnish	½", 1", 1½", 2"	ea.	6 ea. size
Brush, Varnish	3", 4"	ea.	1 ea. size
Lacquer, Metal, Spraying	Clear	gal.	1
Lacquer Thinner	Clear	gal.	1
Metal Enamel	Black	qt.	2
Metal Enamel	Blue, Gray, Green, Red, Yellow	qt.	1 ea. color
Metal Enamel	White	qt.	3
Mineral Spirits	....	gal.	1
Primer, Metal	....	gal.	1
Turpentine	Gum	gal.	1
Paper, Craft, Wrapping, Brown	36"	284 yd. roll	1
Pen Cleaner	Higgins	2½ oz. bottle	2
Pencils	HB, H, 3H, 4H, 6H	doz.	1 ea. size
Rivets:			
Aluminum	⅛ x ¼", ⅛ x ⅜", ⅛ x ½"	lb.	1 ea. hardness
Copper, Round Head	8 oz., 12 oz.	1000/box	1 ea. size
Tinners, Tinned	12 oz., 1 lb., 2 lb., 2½ lb.	1000/box	1 ea. size
Rod, Brazing	3/32, 3/16	lb.	25 ea. size
Sal Ammoniac	Brick	lb.	4
Sal Ammoniac	Powdered	lb.	1
Screws:			
Machine, Flathead Steel	8 — 32, ¼ — 20	gross	2 ea. size
Machine, Flathead Steel	6 — 32, 4 — 40, ⅜ — 16	gross	1 ea. size
Machine, Round Head	8 — 32, ¼ — 20	gross	2 ea. size
Machine, Round Head	6 — 32, 4 — 40, ⅜ — 16	gross	1 ea. size
Machine Screw Nuts	8 — 32, ¼ — 20	gross	4 ea. size
Machine Screw Nuts	6 — 32, 4 — 40, ⅜ — 16	gross	2 ea. size
Sheet Metal	⅜, No. 6	gross	1
Sheet Metal	½, No. 6	gross	1
Sheet Metal	¾, No. 8	gross	1
Wood, Flat Head Steel	½ — 4, ½ — 5, ⅝ — 4, ⅝ — 6, ¾ — 4, ¾ — 6	gross	1 ea. size
Wood, Flat Head Steel	1 — 6, 1 — 8, 1¼ — 6, 1¼ — 8	gross	1 ea. size
Wood, Flat Head Steel	2 — 8	gross	1
Wood, Round Head	½ — 4, ⅝ — 4, ⅝ — 6, ¾ — 4, ¾ — 6	gross	1 ea. size
Wood, Round Head	1 — 6, 1 — 8, 1¼ — 6	gross	1 ea. size
Wood, Round Head	2 — 8	gross	1
Solder:			
Aluminum	Flux-Core	lb.	1
Acid Core	50–50	lb.	2
Paste	Rosin-Base	lb.	2
Rosin Core	....	lb.	2
Silver, Sheet	....	oz.	1
Silver, Solder Flux	Boraxo	oz.	1
Wire, 50–50	5 lb. sp.	lb.	10
Steel Wool	3, 1, 0, 2/0, 3/0	lb.	5 ea. size
Tool Replacement Parts,			
Expendable:			
File Handle	Nos. 1, 2, 3	ea.	4 ea. size
File Handle	No. 4	ea.	2
Hack Saw Blade, 12" Hard Flexible Back	18 teeth/in.	ea.	24
Hack Saw Blade, 12" Hard Flexible Back	23 teeth/in.	ea.	24
Hack Saw Blade, 12" Hard Flexible Back	32 teeth/in.	ea.	24
Handle Wedge	Nos. 0, 1	ea.	12 ea. size
Hammer Handle, 1st Grade Hickory	No. 5, Nail	ea.	6
Hammer Handle, 1st Grade Hickory	No. 6, Ball Peen	ea.	6
Hammer Handle, 1st Grade Hickory	No. 7, Rivet	ea.	6
Jeweler's Saw Blade, 5"	Nos. 0, 2/0, 1, 2, 3, 4, 6	ea.	24 ea. size
Welding Supplies:			
Apron	....	ea.	4
Brush	Wire	ea.	4
Drill Set	Sizes 75–49	set	1
Electrodes, All-Purpose, No. 6010	5/32, 3/16	lb.	50 ea. size
Electrodes, All-Purpose, No. 6013	5/32, 3/16	lb.	50 ea. size
Gloves	....	pr.	4
Spark Lighter	....	ea.	50 ea. size
Steel Rod, Mild	⅛", 3/32"	lb.	4
Tip Cleaner	....	12/box	1
Wire:			
Aluminum, Brass, Copper, Galvanized Iron	No. 18	¼ lb. spool	1 ea.

(Continued from page 77)

Tool	Quantity
Drawing set, hand	12
Drawing set, table	2
Dresser, grinding wheel	1
Drill, electric, portable, ¼"	2
Drill, hand	2
Drill and countersink combination	2
Drill, fraction, set 1/16 to ½"	1
Drill, tapered shank, ½", 9/16", 5/8", ¾", ⅞", 1", each	1
Drill, letter, set, A to Z	1
Drill, number, wire gauge, set, 1 to 60	1
Drill, number, wire gauge, set, 60 to 80	1
Frame, saw, jeweler's	6
Frame, hack saw, pistol grip, adjustable	6
File, flat, 8", bastard	4
File, flat, 8" 2nd cut	4
File, flat, 8", smooth	4
File, half round, rasp, 12"	4
File, mill, 8", 2nd cut	4
File, mill, 8", smooth	4
File, round, 10", smooth	2
Flatter, square, 2½"	1
Gauge, depth, and hook rule	1
Gauge, center	1
Gauge, surface	1
Gauge, American standard wire, No. 281	1
Gauge, U. S. Standard, No. 283	1
Goggles, dark lense	4
Groover, hand, No. 2, 5/16"	2
Groover, hand, No. 4, 7/32"	2
Groover, hand, No. 0, 3/8"	2
Hammer, ball-peen, 16 oz., oval face	12
Hammer, ball-peen, 8 oz., oval face	12
Hammer, ball-peen, 24 oz., oval face	1
Hammer, planishing	1
Hammer, raising	4
Hammer, riveting, 12 oz.	8
Hammer, setting, 10 oz., 4¾" head, ¾" wide	8
Hardie, anvil, ⅞"	1
Jig, bending	1
Kit, machinist's, for metal lathe	2
Knife, sloyd	3
Ladle, melting	1
Ladle, bottom pour	1
Mallet, leather	6
Mallet, rubber	6
Mallet, wood	4
Mask, welding, arc	4
Metal spinning tool set Ball-point tool, 26" handle	2
Metal spinning tool set	
Beading tool, 26" handle	2
Cutoff tool, 26" handle	2
Flat tool, 26" handle	2
Point tool, 5/8", 26" handle	2
Tool rest, 10", 9 holes	2
Micrometer, 0"–1"	1
Micrometer, 1"–2"	1
Monogogles	8
Pliers, round nose, 6"	2
Pliers, flat nose, 6"	4
Pliers, slip joint combination	2
Pliers, diagonal cutting	1
Pliers, side cutting	4
Pliers, needle nose	2
Plate, surface, 12" x 18"	2
Punch, center	4
Punch, pin, 1/8", 3/16", ¼", each	1
Punch set, hand, interchangeable dies, 1/16" to ¼"	1
Reamer, adjustable, set, 15/32 to 1½"	1
Reamer, center, ⅜ x ½"	1
Reamer, center, ⅜ x 5/8"	1
Reamer, center, ⅜ x ¾"	1
Reamer, burring, ½", round shank, ¼" to 1¼"	1
Rivet set No. 2	2
Rivet set No. 4	2
Rivet set No. 6	2
Seamer, hand, ⅞ x 3½", adjustable	2
Scale, hardwood, architect's	12
Screw driver, common, 6", 8", 10", each	2
Screw driver, phillips, Nos. 5–9, each	1
Square, steel, 12 x 8"	8
Square, steel, framing	4
Sharpener, pencil, common	1
Sharpener, pencil, draftsman	1
Snips, aviation, right hand	1
Snips, aviation, left hand	1
Snips, tinner's, straight	2
Snips, tinner's, duck bill	2
Snips, tinner's, right hand	1
Stone, sharpening, carborundum	2
Stone, slip	2
Stake	
Beakhorn	1
Blow horn	2
Bottoming	2
Double seaming	1
Double seaming with four heads	1
Hatchet	1
Square	1
Needle case	1
Swage, bottom, ½"	1
Swage, bottom, ¾"	1
Swage, top, ½"	1
Swage, top, ¾"	1
Tap, NC set, ⅜" to ¾"	1
Tap, NF set, ⅜" to ¾"	1
Tool, chipping	3
Tongs, gad, 24"	2
Tongs, blacksmith, 24"	2
Turning machine	
Ogge bead, set	1
Crimping, set	1
Burr, set	1
Single edge, set	1
Wiring, set	1
Triangle, 30–60 degree, 8"	18
Triangle, 45 degree	18
Triangle, 30–60 degree, 14"	3
Triangle, 45 degree, 14"	3
Vise, bench, drill, 2⅜" long, 2⅝" open jaws	2
Vise, machinist's, 3¼" jaw, stationary base	4
Vise, machinist's, 3¼" jaw, swivel base	6
Vise, machinist's, 2½", stationary base	4
Vise, pipe	1
Wrench, box, ¼" to 1" set	1
Wrench, end, ¼" to 1", set	1
Wrench, end, adjustable, 10"	2
Wrench, monkey, 12"	1
Wrench, tap, 7"	1
Wrench, tap, 16"	1

General Woods and Crafts

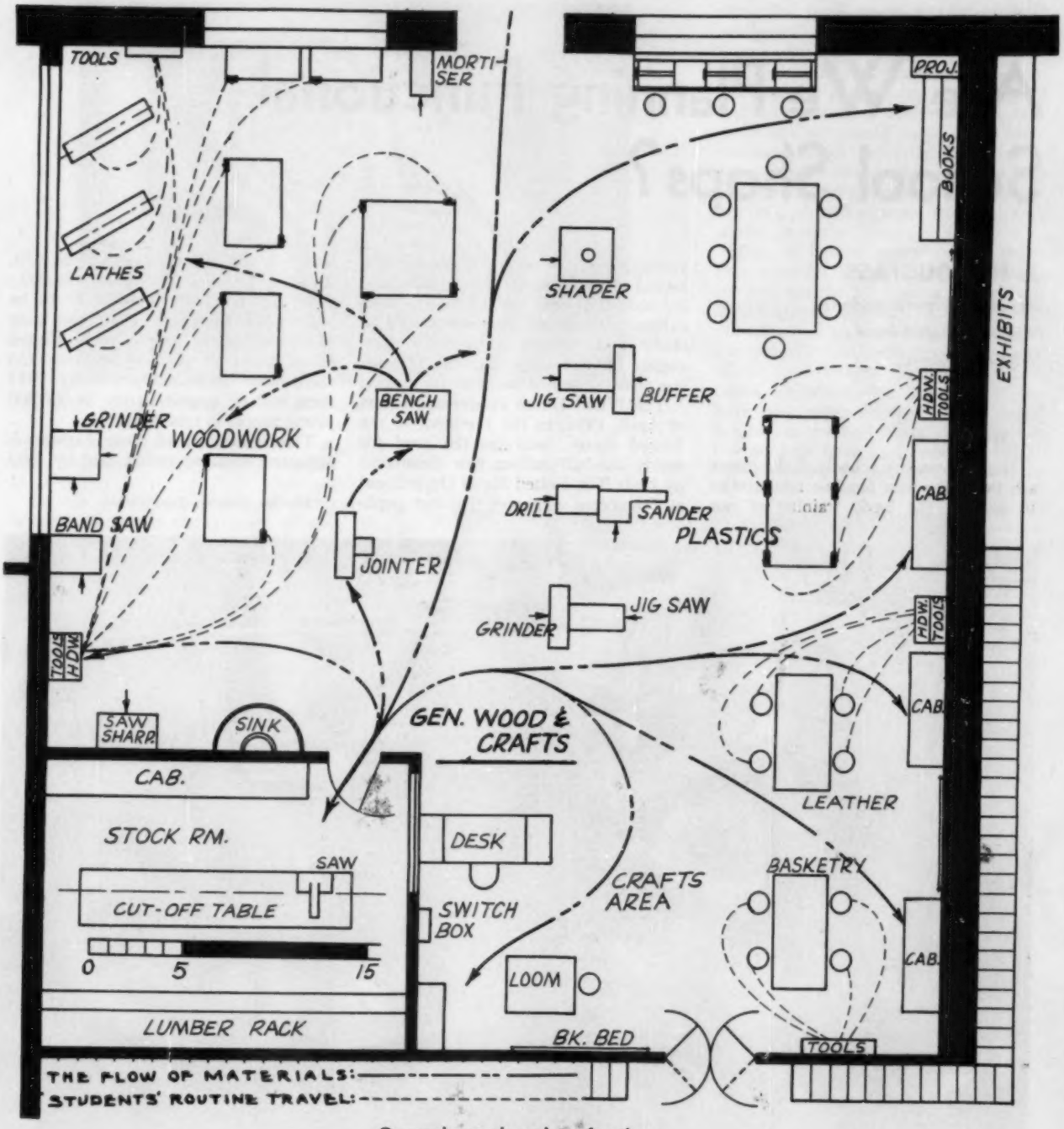
RALPH O. GALLINGTON
Chairman, Industrial Education Department and Acting Head of Applied Science
Southern Illinois University
Carbondale, Ill.

This shop is a modified general shop for 20–30 students, similar in organization to the general metal, electricity, and ceramic shop in the junior-senior high industrial-arts wing. Weaving, basketry, leatherwork, plastics, and general woodworking are included. These instructional areas are provided for in the floor space as well. Each instructional area has some particular relationship to the working of wood also.

The plastics area makes use of many woodworking tools and machines. For that reason the sander, drill press, and jig saws are placed in a position within reach of each area. Weaving, basketry, and leatherwork all make use of forms, fittings, and blocks made of wood; hence, the general machines are in a position to service these areas as well as the woodworking area itself. Certainly all areas are equally close to the stockroom.

Each instructional area has its own tools and equipment and may function independent of the other areas. The planning area is in a light section of the shop and is accessible from all instructional areas. The teacher's desk is in a position so that all students are visible and accessible at all times. Work stations are equally spaced in order that the whole shop will be in use.

Outside loading doors are provided so that lumber and other heavy supplies may be received without disrupting



General wood and crafts shop

other school activities. A wide aisle is necessary so that these materials may be moved in easily. A small hand truck is available for use in the shops.

Inside the stockroom is a cutoff saw and table. This saves a great deal of walking and cuts down the moving of heavy lumber. Just outside of the stockroom is a jointer, the first power tool generally used on rough lumber. Next in line is the bench saw. From here the stock may move back to the jointer or to various other work stations in the shop. Regardless, the flow line from this point is less precise than it is up to and including the bench saw. Stock may be distributed to any instructional area without disrupting the work at any other area.

All nonspecialized machines are located in the center of the shop so that the various instructional areas have equal access to them. This allows for the puschase of an adequate number of machines with less duplication.

Locker space is provided in the hall. This should accommodate most small projects, but in the plan of the junior-senior high industrial-arts wing it will be found that a project storage is located just across the hall. This proximity was planned especially for the assembled and large woodworking projects.

Are We Planning Functional School Shops?

J. H. DOUGLASS
Assistant Superintendent
Winfield High School
Winfield, Kans.

If our secondary schools of the future are to be the best possible laboratories to provide the basic training of our young people for an increasing technological civilization, it will be necessary for industrial arts and vocational education teachers and administrators to study and prepare themselves thoroughly for the tremendous job of helping plan the school shops of the future.

The White House Conference report of April, 1956, to the President of the United States, indicates the need for nearly one-half million new classrooms by 1960. The United States Department of Commerce estimates that our population by the end of 1956 will be 170,000,000; by 1960 it will be 179,000,000; and by 1975 it is likely to be around 228,000,000. In 1940 there were 47,000,000 young people in the United States under 17 years of age; in 1955 there were 56,000,000; and by 1975 there will be approximately 84,000,000 young people in this group.*

The significance of these statistics is apparent when we realize that by 1975

*American Observer, July, 1956.

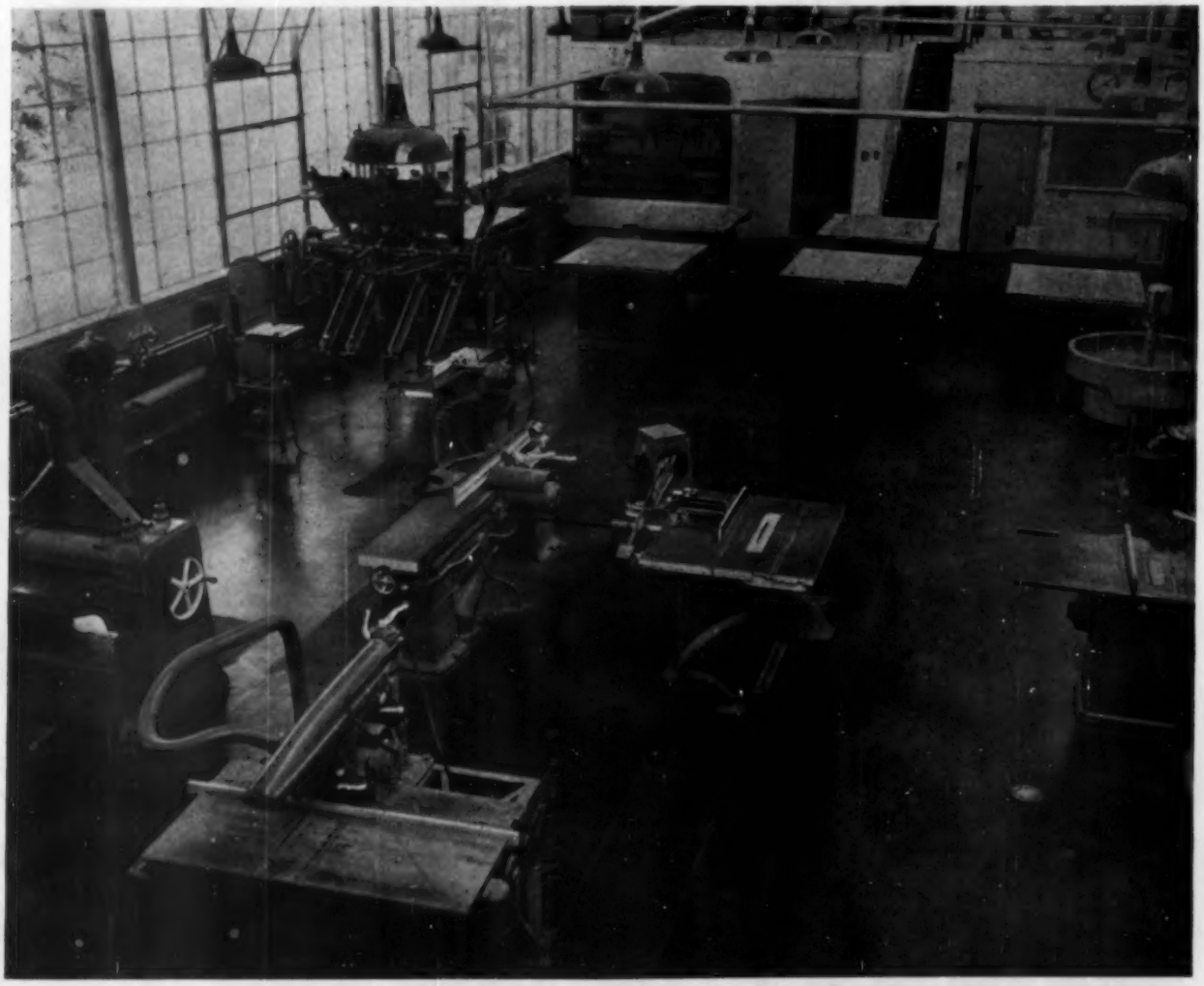


Fig. 1. Placement of equipment in the woodworking shop, Winfield High School, Winfield, Kans.

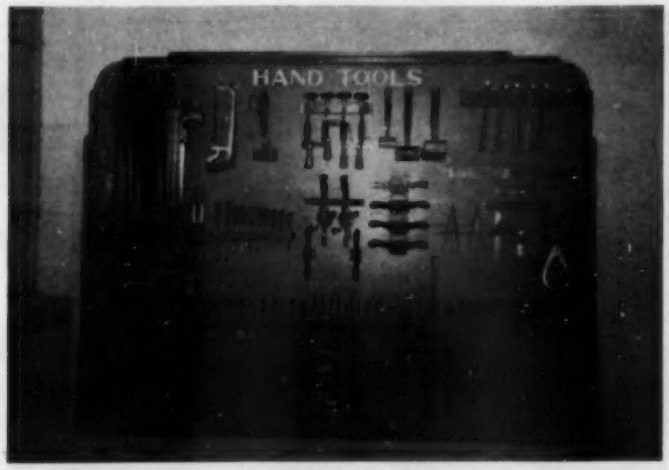


Fig. 2. Wall panel for hand tools

we will have approximately twice as many students in high school as we had in 1940.

On the average, high school plants become obsolete in thirty years or less. Shop rooms and buildings may become obsolete much sooner due to the rapid changes in industrial progress and processes. For this reason, teachers and administrators in this field must help develop shop plans that will remain modern as long as possible and that can be remodeled to meet the changing needs of the future.

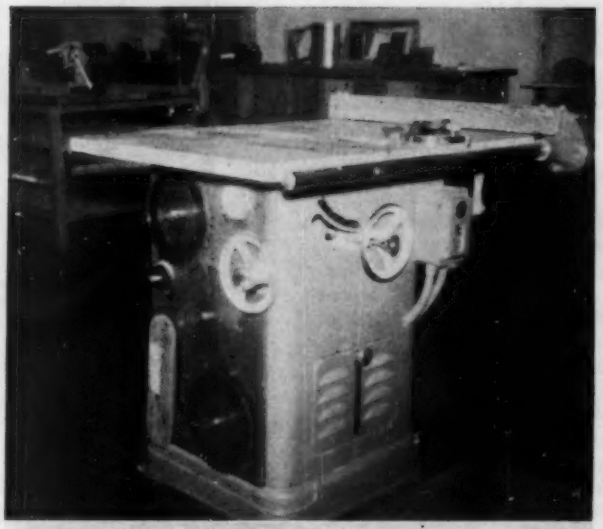
Too often shop planning is done by general school architects who have little knowledge or understanding of facilities needed for a comprehensive industrial arts and vocational education program. Boards of education are often reluctant to use their shop instructors and experts in the field for advisory councils to the general architect. Unfortunately, it is true that the shop teacher might have little to contribute due to lack of experience or to lack of training in this field where his college education was obtained.

Teacher education institutions will need to devote much time to this phase of teacher training if we are to have the best possible shop laboratories planned for the future. The selection of proper shop equipment is also a challenge that requires an understanding of aims and objectives of the courses, together with proper placement.

While it is difficult to approach perfection in shop planning, it is discouraging to visit some of the new high schools and shop buildings recently completed throughout the country and to see that so many of them are poorly planned or are inadequate to take care of the present needs and future trends. Per pupil floor space is inadequate in many of them, arrangement of equipment poor, storage space inadequate, and lighting and ventilation leaves much to be desired. In some places the selection of equipment did not fit the needs of the course offered.

The intricacy of shop planning confronting our present-day shop teachers and administrators varies from a one-room unit or general shop, to the large vocational and industrial-arts departments housed in the comprehensive high school building, in a separate shop building unit, or as a separate technical high school or trade school.

Due to limited space and to problems involved, no attempt will be made in this article to discuss criteria or specifications necessary for successful planning of a series of shop laboratories adequate for the medium or large high school enrollments. Many excellent books, pamphlets, and magazine articles have been published that will be found helpful in over-all shop planning. A few of these have been listed for reference at the end of this article. However,



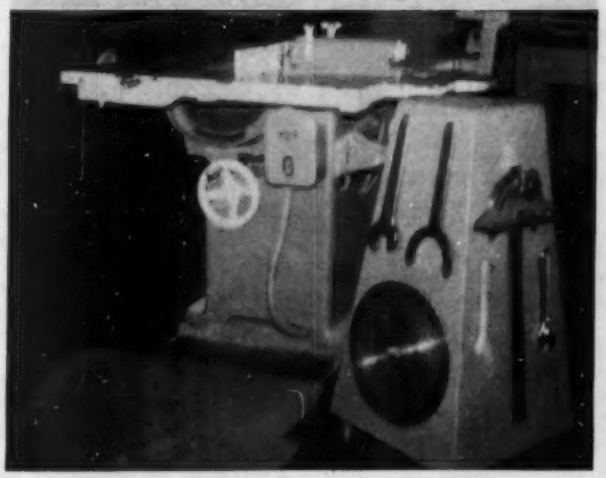


Fig. 3. Machine base accessory rack, at top, and a portable pyramid accessory rack

since many of the same principles of planning are common to most shops, a discussion of some considerations of planning one shop room may be helpful in planning larger units.

The woodworking or cabinetmaking shop was probably the first to be integrated into the high school curriculum. Strangely, it seems to have stood the test of time and is still considered an essential part of the industrial-arts curriculum. Since it is one of the basic shops common to most schools, we will use a senior high school woodworking shop to illustrate some considerations in shop planning. Twenty-four work stations are used in this discussion.

1. Adequate floor space should be provided as follows: forty square feet per pupil in workbench area; thirty-five square feet per pupil in machine area of room; ten square feet per pupil in project assembly area; ten square feet per pupil for finishing room; fifteen square feet per pupil in project storage area; ten square feet per pupil in lumber storage room. This makes a total of 120 square feet of floor space per pupil.

2. Adequate natural lighting must be provided. This requires 35 candle power at all work stations and up to 70 candle power for drafting and other classwork of this nature. North light is best. Nonglaring artificial lighting should be provided for evening classwork.

3. The workbenches, power machines, and lumber storage racks should be housed in the same room with additional lumber storage facilities in an adjoining room, Fig. 1. (Complete plans for this vocational shop building are shown in the March, 1953, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION magazine, pp. 73–78.)

4. The shop room needs to be approximately twice as long as it is wide. (Avoid square or long, narrow rooms.)

5. Keep benches near one end of room, machines in the other. A project assembly area may be provided between the two or in one end next to the workbenches.

6. Arrange the woodworking machines so that lumber may be routed from lumber room or rack through machines in correct order for milling the stock.

7. Arrange hand tool panels on wall convenient to workbenches. See Fig. 2. Saw blades and other machine tool equipment should be mounted on a panel fastened to one side of machine base or on portable pyramid racks as illustrated in Fig. 3.

8. Individual locker space may be provided in walls of shop or under workbenches.

9. A half-round wall type wash fountain saves floor space. A drinking fountain attachment is also convenient.

10. An individual toilet should be attached to each shop room. This helps to eliminate hall confusion and makes for better class discipline.

11. The finishing room should contain spray booth and good exhaust system. It should join the shop room next to the workbench area. An adequate storage space area needs to be provided in an adjoining room for unfinished project storage.

12. A small planning area, together with shelves for reference materials is essential for student use.

13. One of the most important features of a modern woodworking shop is a dust and shavings collection system. Collection ducts attached to the machines may be installed under the floor, and piped to an outside vacuum collector, Fig. 4. This system should also include a sweep-in duct for disposal of shavings around the bench area.

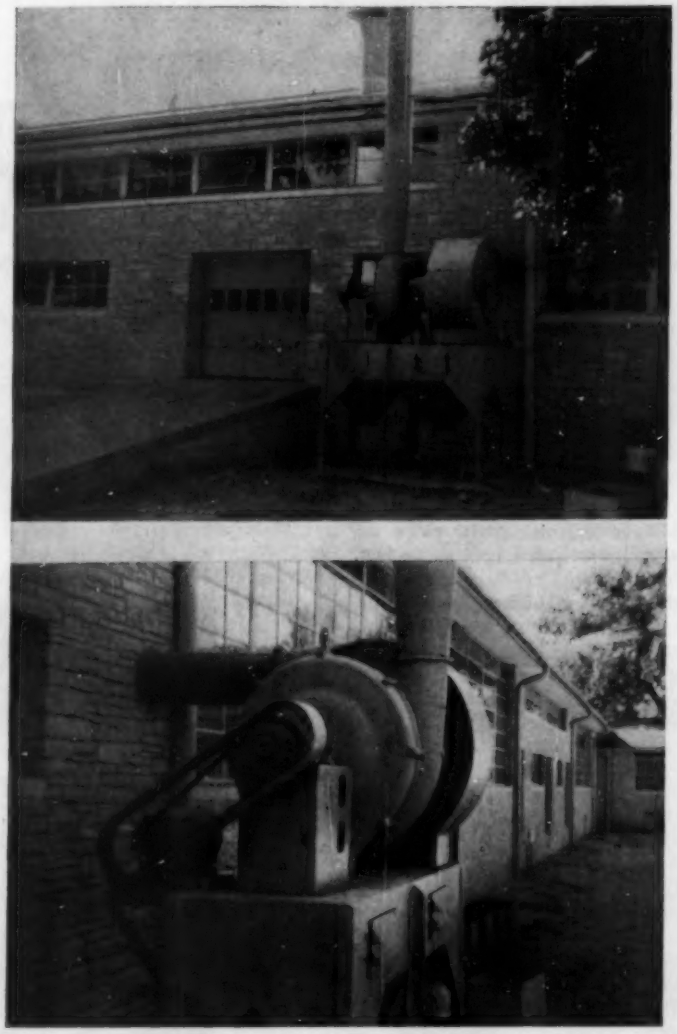


Fig. 4. Dust and shavings collector

After a committee appointed by the superintendent of schools has completed a survey of the community to determine the present and the possible future needs of the community, a special committee composed of school administrators, shop teachers, member of board of education, school architect, and a shop planning specialist should be organized. They should spend as much time as possible in visiting modern, well-planned school plants, in doing research, and in developing preliminary plans before the final building plans are completed by the architect chosen.

This procedure will eliminate many common mistakes and will make it possible to provide the good shop laboratories necessary for training our future scientists, engineers, craftsmen, and other citizens of our democracy.

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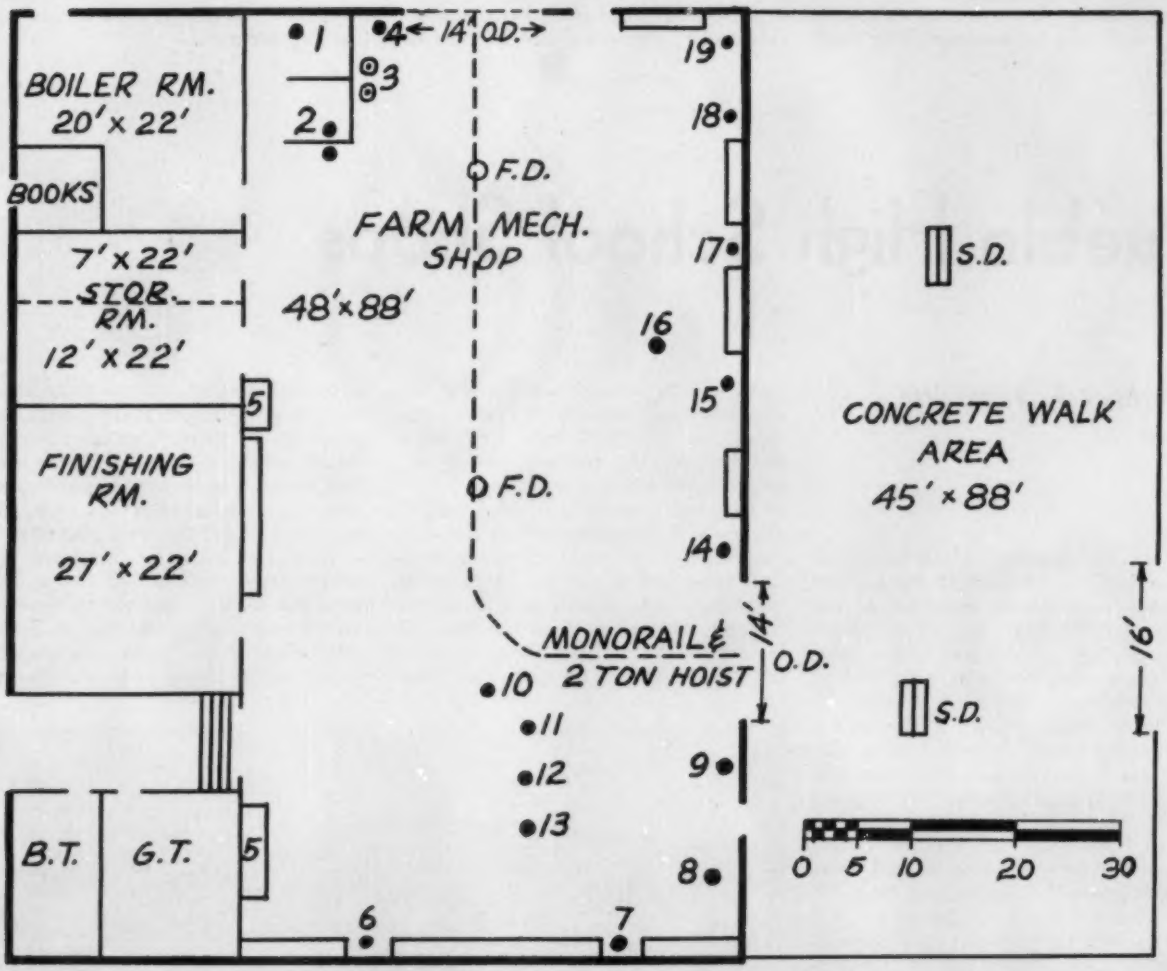
New Facilities in Vocational Agriculture

HARRY T. MILLER
VoAg Instructor
Frederick High School
Frederick, Md.

The new Frederick High School Vocational Agriculture building, occupied for the first time at the beginning of this school year, is constructed of concrete block, faced with brick to conform to the main high school building. High school students, as well as young farmers and adult groups, have access to the complete facilities of the building, which is suited for teaching all phases of vocational agriculture — including classroom instruction, laboratory and greenhouse instruction, and instruction in farm mechanics.

As one enters the building through the main entrance, the double doors open to a hallway that runs the entire width of the building. The floor is of terrazzo, and lockers are built into the wall on both sides. On the left of the



Vocational Agriculture Shop at Frederick High School

1. Electric welder; 2. electric welder; 3. gas welder; 4. 14-in. drill press; 5. wash-up sinks; 6. 17-in. drill press (wood); 7. scroll saw; 8. wood lathe; 9. band saw; 10. table saw; 11. 6-in. jointer; 12. 12-in. jointer; 13. 24-in. planer; 14. air compressor; 15. metal lathe; 16. hack saw; 17. 17-in. drill press (metal); 18. 10-in. grinder; 19. gas forge; 20. 12-in. grinder

F.D. — Floor Drain; S.D. — Sewer Drain; O.D. — Overhead Door

hall you will find the office-conference room, two classrooms divided by a folding door, and a laboratory to be used for testing milk and soils; on the right, are toilet facilities for both men and women. Outside, a small greenhouse has been constructed for experimental and educational use in agriculture.

To the right of the hall is located the farm shop, constructed approximately four feet below that of the classrooms. The shop consists of the main shop area, a finishing room, a storage and a boiler room that houses a complete oil burner hot-water system, which furnishes heat and hot water for this new Agriculture building.

Two 14-foot overhead doors provide entrance to the shop, one near the back end and the other located on the side near the front, as indicated on the layout. The side door opens to an outside work area 45 feet by 88 feet and is enclosed by a brick wall with a 16-foot opening in line with the shop door. The main shop area is 88 feet by 49 feet in size, and has a concrete floor and painted-block walls. A large concrete apron for turning machinery is located outside the back entrance, and a blacktop road runs from the back entrance around the building. A monorail and two-ton hoist run from the one overhead door through the center of the shop to the other overhead door. Near each large door there is a small exit door.

Workbenches in the shop are mounted on the wall by triangular braces fixed in the block construction. As indicated by the plans, much of the power equipment is located along the walls according to areas of similar use. Natural lighting is provided by plenty of windows plus a nonglare skylight, while artificial lighting is fluorescent throughout the building. The shop is wired both for single phase 110 and 220 and 3 phase current. All power equipment with motors of ½ horsepower and above are run on three phase current. There is available outside of each large door 3 phase and single phase weatherproof receptacles. One-hundred-ten volt receptacles are located every four feet around the wall of the shop just above the workbenches. All machines are grounded individually, and each is controlled by a separate breaker located in a locked breaker box as well as each machine having overload protection. A welding booth is provided for arc welding and gas welding. Exhaust ventilators are provided over the gas forge, welding booth, and likewise in the finishing room. Wash-up facilities and drinking fountains are provided in the shop.

It is planned to use several tool rooms mounted on the wall in respective work areas plus the use of several tool dollies to store the tools. Lumber and metal racks are placed on the long side of the storage room; portable power tools, on the short side. Paints and paint materials will be stored in the finishing room.

The instructors, two at present, feel that the facilities are adequate, functional, and necessary for a satisfactory teaching program.

Pueblo High School Shops

HERMAN R. BERLOWE
Tucson, Ariz.

With the opening of the first high school in Tucson since 1938, industrially minded high school students in the south part of this city will no longer be crowding into Tucson high's bulging classrooms, last year estimated to have held more than 5000 students.

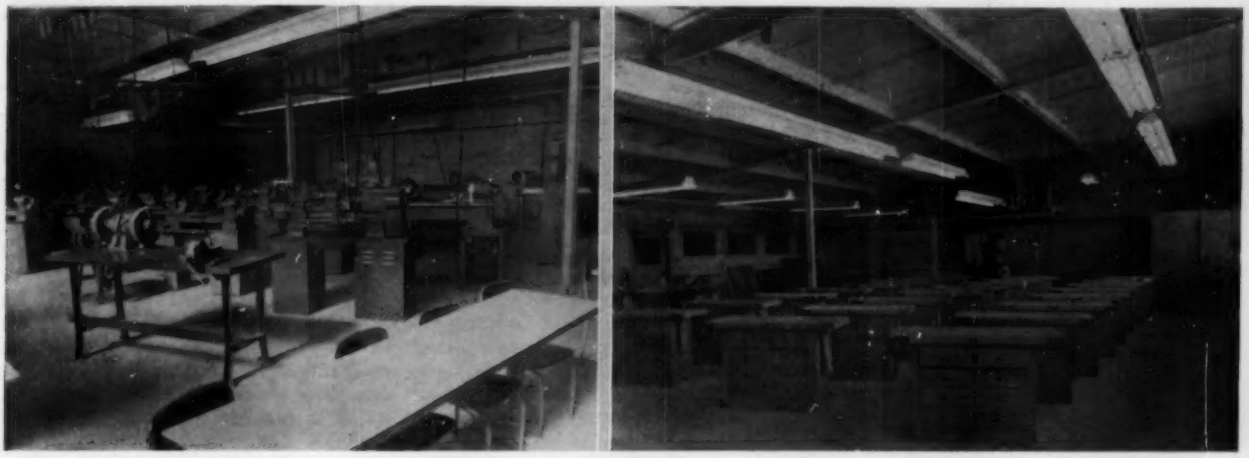
Pueblo high school, a two-million dollar institution, opened earlier this year on Tucson's south side where live the predominant number of Tucson's large Mexican population. Although some 1,100 students occupied Pueblo in its first days of operation, that figure is now gradually approaching the 1,500 mark. And the school's youthful principal, Elbert D. Brooks, already confronted with unexpected problems of space, is beginning to wonder where he is going to put the growing student body in the next few years.

The fact that of the 1,300 students now enrolled, 886 are in industrial arts gives one an idea of how popular this education program is with Pueblo's students. Of the 886, there are 214 in the homemaking courses, leaving 672 in the industrial-arts program.

This latter figure is divided into 43 classes with an average of 20.6 in each class spread over eight courses — welding, radio and electricity, sheet metal, machine shop, woodshop, mechanical drawing, photography, and printing. Incoming freshmen have their choice of any of the above, the first four listed as general metals 1 & 2 and photography and printing grouped in the graphic arts schedule. In general metals, students rotate, taking a different course every nine weeks. Graphic arts freshmen alternate, too, taking 18 weeks each (one semester) of printing and photography.

With two years of industrial arts behind them, juniors and seniors may then choose, if so inclined, to continue an extensive vocational program in their final years. If they choose to specialize in any of the above, as auto mechanics,

Shop wing of the Pueblo High School, Tucson, Ariz.



The machine shop at left, and on the right, the woodworking shop at Pueblo High School

upperclassmen divide their time 50-50 between their vocational *major* and academic studies.

"We have placed heavy emphasis on industrial arts," says Principal Brooks. "We encourage every freshman to select an industrial-arts course for two reasons: (1) because the student may develop a fine hobby, and (2) because it provides the student with an opportunity to use his hands. The response has been good. Of course, we also encourage consideration of the fine-arts courses, too."

Pueblo's new mechanical drawing, driver education, and auto-mechanics shops are presently under construction, and should be available for the 1957 school year. Advanced vocational studies are taken at Tucson high's vocational school near downtown Tucson.

Let's take a leisurely look at Pueblo's brand new shops, which are located in a simple, red-brick and glass wing on the south side of the school, apart from the other classrooms.

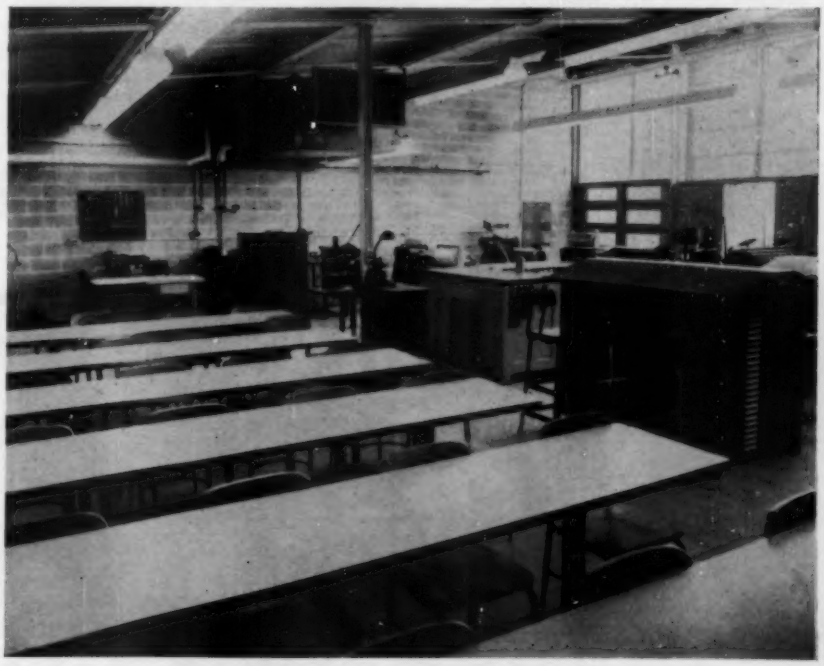
The sheet-metal shop consists of a 42 by 60 ft. room, with a cement floor and high, overhead fluorescent lighting, physical characteristics found also in the other shops. Its equipment, described as mostly *standard* by the instructor, includes a cornice brake, box and pan, bar folder, slip rolls, ring and circle shear, squaring shear, lock former and drill press. As in the other shops, there is plenty of natural light in the room.

Somewhat smaller, 40 by 40 ft. in size, is the simply outfitted radio and electricity unit. The students deal basically with hand tools, and the equipment here is the standard usually seen in most high school radio and electricity classrooms.

Industrial school machine shops present, perhaps, the most impressive appearance of all industrial-art branches, mostly because of the array of sturdy, shining machinery that confronts the eye upon entering the shop. At Pueblo's 40 by 56 ft. machine shop, there are 18 small Model A-9-in. lathes, a standard milling machine, surface grinder, three 8-in. shapers, two drill presses, 12- and 13-in. lathes, power hack saw, and a 10-inch bench grinder. As in the case of the other shop courses, machine shop classes are set up to handle 24 students, who are judged on "what they can do and what they must know."

The graphic-arts courses, which include printing and photography, are located in the east end of the wing with windows facing north. The large classroom is 40 by 40 ft. and boasts four hand lever presses, Virkotype machine, bookbinding table, stapler and punching machine, 26½-in. paper cutter, make-up stone, two 14-rack dryers, two galley cabinets, 12 type cabinets supplying 24 work stations. Beginners use 10-point Garamond, while advanced students work with more Gothic and Script type faces. This shop also has a Kwik-Print gold-stamping machine, and Mono-tabular, and miter machines. And this is the one unit that has tiled floors, which cushions type dropped by students. Desks are 22 by 96 in. in size.

Pueblo's photography division has made a very promising beginning, and its instructors are enthusiastic about the response. Immediately behind the printing classroom is the 9 by 15-in.



Pueblo High School print shop

portrait room, and its air-cooled comfort is due to the refrigerated air coming into all the photography rooms from circular ceiling ducts. Photographic chemicals make refrigerated cooling necessary. The workroom is 12 by 16 ft. It has plenty of storage space in hardwood cabinets underneath the enlarger booths. Eight to 10 students can work here with equipment which includes two 4 by 5-in. Speed Graphic Pacemakers, one Linhof 4 by 5-in., and 14 Argus 75 fixed lense cameras used by beginners.

The 18 by 18-ft. darkroom has 10 contact boxes, six solar enlargers, a developing table, three trays, wash tank and two 10-gallon developing tanks. There is also a small 4 by 9-ft. stock room and two loading and developing rooms, each 6 by 6 ft. The neophyte photographer at Pueblo high has the tools to work with and the opportunities, too.

Woodworking and welding make up the two remaining new shops at Pueblo, as auto mechanics and mechanical drawing are taught in makeshift rooms until the next addition is ready. The woodshop is housed in roomy quarters comparable in size to the other shops and has 24 single workbenches with vises. There are six student drawers in each bench, each drawer containing a set of tools most usually required. Ten-inch circular saw, 14-inch band saw, two joiners, one surfacer, drill press, two lathes, and a disk sander compose most of the essential equipment. A dust control system, an 8 by 8-ft. spray room and a 26 by 12-ft. finishing room are features of this department, which also has a 7 by 7 ft. storage room. Lumber is stored on a metal five-tier rack, and is ordered through the school system in large lots.

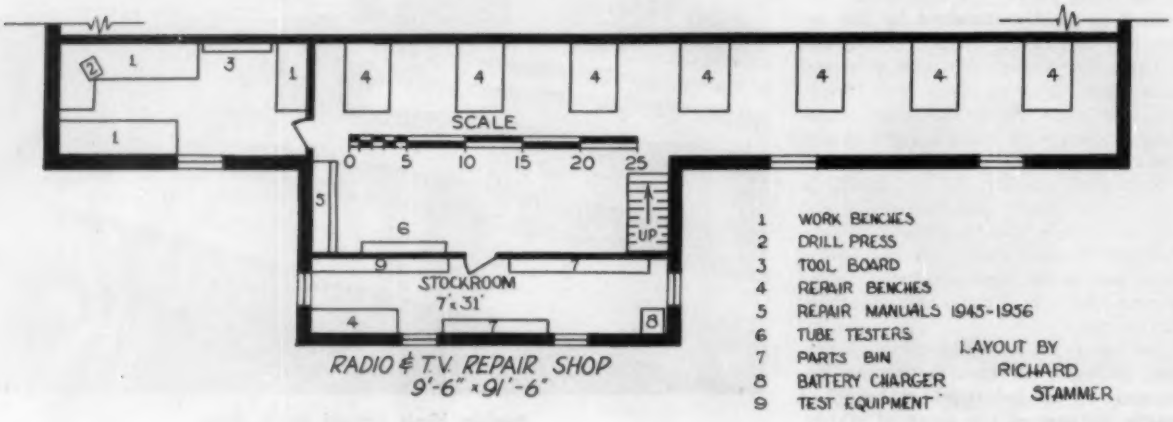
The welding shop rounds out our tour of Pueblo's new industrial-arts departments. Here we find oxyacetylene welding, two benches for cutting torches, 12 booths for arc welding, six a.c. and 6 d.c. machines, three gas forges, three anvils, three straight peen hammers and eight bolt tongs. Caution is the byword here with both the acetylene and oxygen generators stored in a distant corner. The acetylene generator, with a capacity of 200 pounds, is the biggest in the Tucson school system. Safety is constantly preached, as welding is the one shop where students are more exposed to possible accidents. Additional facilities include a device to draw out gases, drill press, grinder, and wire buffing wheels machine. There is also a 10 by 10 supply room.

A College Trade Department Takes Inventory

W. W. LUDEMAN
President, Southern State Teachers College
Springfield, S. Dak.

The trade department was established at Southern State Teachers College by Board of Regents action in 1948. There has been a great need in the state for post high school education along vocational lines and because Southern had a strong industrial-arts department it was decided to place the trade training alongside the other shop work and parallel to the teacher training division.

The trade department had meager beginnings. It was started in the fields of auto mechanics, body repair, and wood trades. There were few students and the equipment was skimpy. Year by year since 1948 new courses were added until now the offerings include auto mechanics, body repair, carpentry, cabinetmaking, upholstery, drafting, radio-TV, and refrigeration. From basement quarters in a classroom building the trade work has branched out into



three new spacious shop buildings and partial use of two others. From two instructors the staff now has ten instructors beside some part-time help.

Rank of Trade Interest

Southern has kept close tab on potential demand for types of vocational training in establishing new courses. Since 1948 the total enrollment in the different trade departments has been:

Fall Term	Auto Mech.	Body Rep.	Carpentry	Cabinetmaking	Upholstery	Drafting	Radio — TV	Refrigeration	Electricity	Gen. Metals
1948	12	11	3	3	..	..	..	..	..	..
1949	16	15	3	..	2	..	..	..	9	11
1950	18	17	..	8	..	..	..	..	7	4
1951	20	20	..	4	..	3	..	..	5	1
1952	28	6	2	4	2	2	..	..	..	..
1953	43	9	2	2	3	..	..	..	..	..
1954	35	20	10	2	2	1	17	..	..	..
1955	62	25	11	11	11	4	36	..	..	..
1956	52	28	22	10	10	8	30	2	..	..

It appears here that automotive trades will always be most popular with radio-TV a close second since it started three years ago.

Vocational Equipment Is Costly

To adequately equip shops is expensive. Southern has expended at least $75,000 for shop equipment alone. Changes in models of autos or certain aspects of them bring a need for new shop equipment. For example, a change from 6-volt to 12-volt auto batteries cost our auto shop over $1,000 for new tune-up equipment.

The Curriculum Now Standardized

After eight years of experience the various trade curriculums have now been standardized rather uniformly. In all courses the student takes four quarters of training. Along with the actual shopwork the students must take shop drawing and shop knowledge which is a combination of basic English, shop math, and elementary business law. The courses are broken into subdivisions, for example, auto mechanics has four subdepartments, front end, tune-up, motor overhaul, and general mechanics with departmental shops for each part. The student spends one quarter in each division.

What of College Credit?

College credit is given to students in vocational training if college entrance requirements are fulfilled. Nongraduates of high school are admitted if they are 19 years of age or above and can show aptitude for the training. It is possible for the qualified trade student to continue on a four-year degree in vocational training for high school general shop teaching. Many young men have been following this four-year program after their first year on a trade basis.

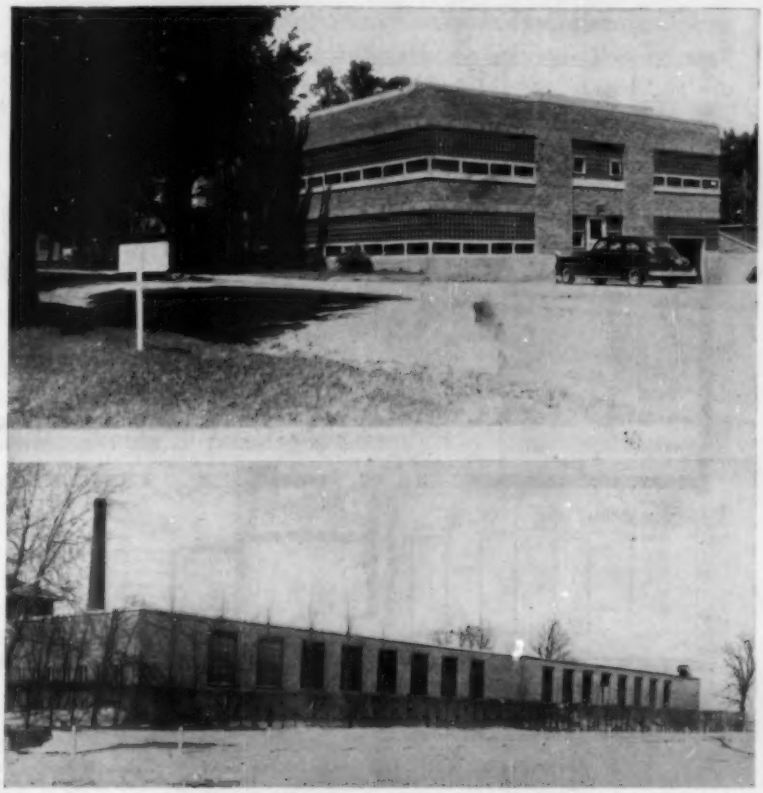
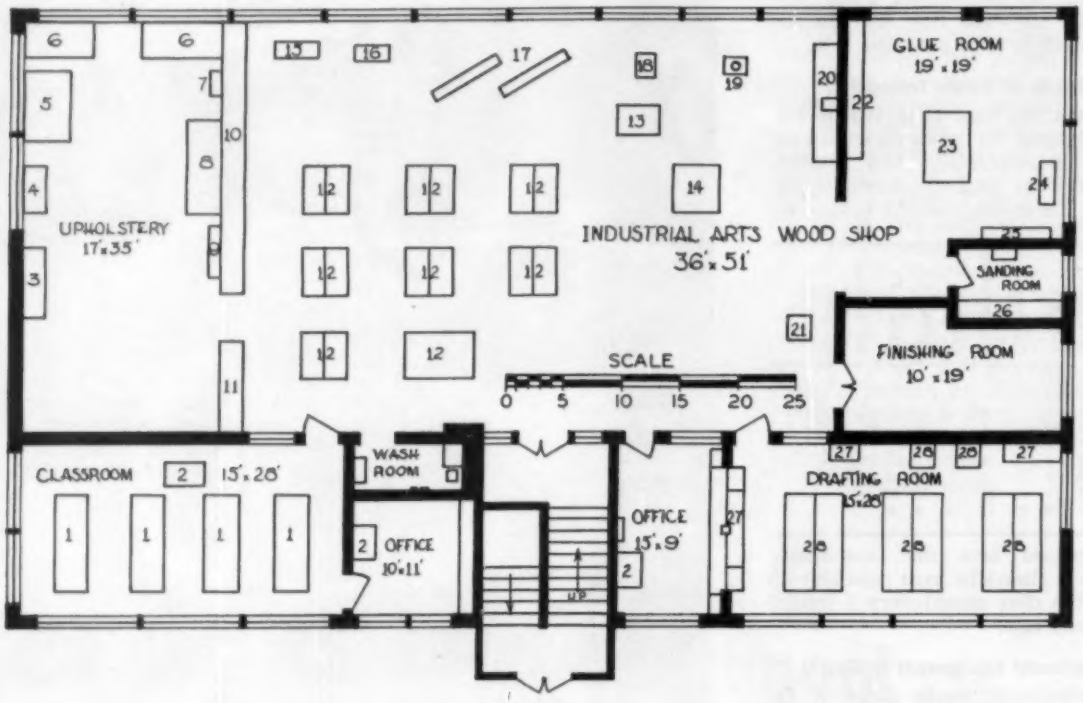


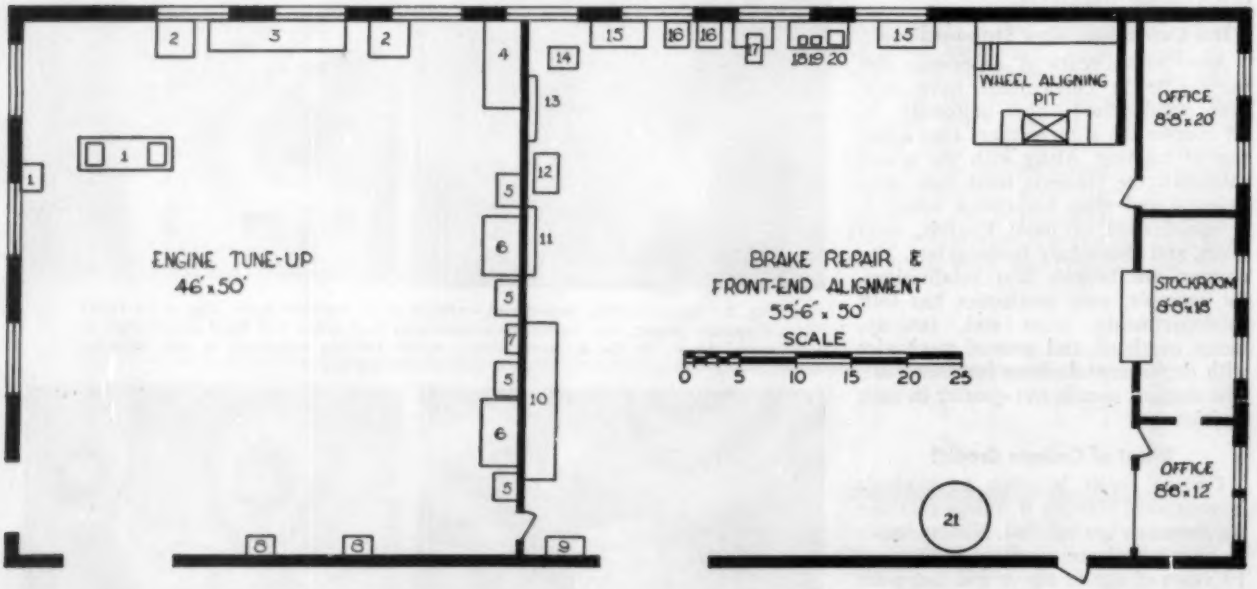
Fig. 1. Industrial Arts Building constructed in 1948, houses the shops for industrial arts, wood trades, and drawing and drafting. Two floors. Fig. 2 (lower). Automotive Shop Building built in 1952 and added to in 1956. It houses the auto mechanics and body repair work, with parts room, offices, and classrooms

Fig. 3. Cabinetmaking department — offered on a one-year basis. Fig. 4 (at right). Carpentry project. The student gets experience in framing and basic construction on model houses in the carpentry shops. Actual building experience is also furnished as a part of the training

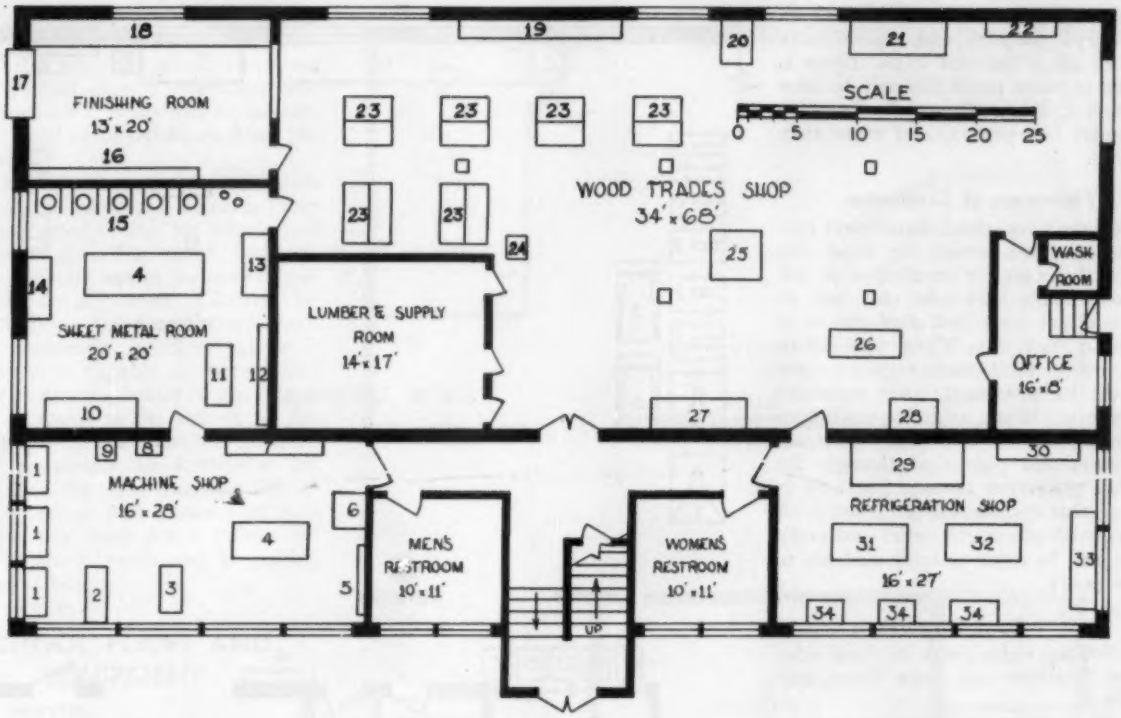
Fig. 5. Motor tune-up department. Fig. 6 (at right) In the body repair shops. This course is a one-year program and prepares young men for shop jobs



Key to layout: 1. Tables; 2. desk; 3. sample closet; 4. heavy sewing machine; 5. sewing table; 6. worktables; 7. storage cabinet; 8. large workbench; 9. tool board; 10. wood projects cabinet; 11. tool cabinet; 12. fifteen workbenches; 13. table saw; 14. planer; 15. jointer; 16. jig saw; 17. two lathes; 18. grinder; 19. drill press; 20. radial arm saw; 21. band saw; 22. scrap rack; 23. glue table; 24. jointer; 25. clamp rack; 26. sanding table; 27. drawing equipment cabinets; 28. drawing tables



Key to layout: 1. Chassis dynamometer; 2. electric servicers; 3. starter, generator, distributor bench; 4. carburetor repair bench and tools; 5. four engine analyzers; 6. analyzer benches; 7. tune-up tester; 8. distributor testers; 9. parts washer; 10. transmission bench; 11. tool boards; 12. portable wheel aligner; 13. brake tool board; 14. brake drum turner; 15. workbenches; 16. two de-rivetors; 17. honing machine; 18. brake shoe sander; 19. brake lining tester; 20. two bonding machines; 21. hand washer



Key to layout: 1. Three metal lathes; 2. shaper; 3. band saw; 4. sheet-metal table; 5. tool panel; 6. desk; 7. metal storage rack; 8. soldering booth; 9. grinder; 10. pan break; 11. bar folder; 12. tool panel; 13. sheet metal roll; 14. metal shears; 15. five welding booths; 16. supply and storage; 17. fan; 18. drying rack; 19. tool cabinet; 20. band saw; 21. glue table; 22. clamp rack; 23. twelve workbenches; 24. jig saw; 25. table saw; 26. jointer; 27. radial arm saw; 28. shaper; 29. workbench and test panel; 30. tool cabinet; 31. worktable; 32. worktable; 33. parts bins; 34. cooling units

Other Phases of Program

1. *Shop Projects.* Trade students are given training on a regular shop basis. In auto mechanics — they repair autos; body repair — rebuild and repaint autos; drafting — design plans and make blueprints; carpentry — build structures; upholstery — rebuild and recover furniture; radio-TV — repair sets.

2. *Charging Customers.* There is no difficulty in getting plenty of work for repair or construction. Customers are charged for materials and a nominal sum (about one-third regular charge) for labor.

3. *Vocational Account.* All monies for materials bought or sold for shop projects and for labor fees are kept in a central vocational account. A book-

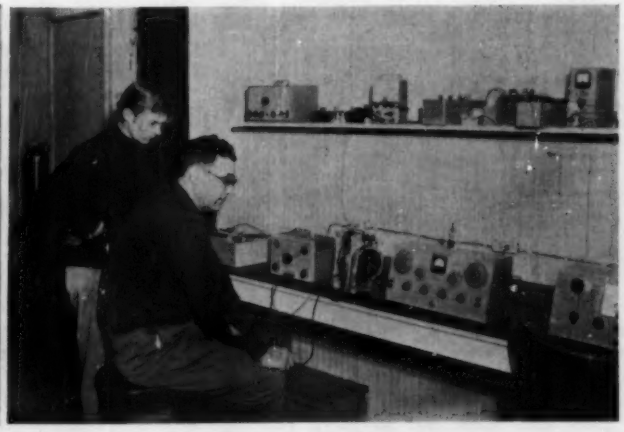


Fig. 7. Upholstery department. A popular course in vocational department. Many students start their own shops and do very well in this field. Fig. 8 (at right). Testing equipment in radio-TV department. Southern offers a one-year, two-year, and four-year program in electronics for shop, technician, and teaching occupations

keeper and parts men are used in all shops and incomes and expenditures handled on a business basis. There is no aim to make profit but only to keep in good balance. Shopwork done for customers last year totaled more than $20,000.

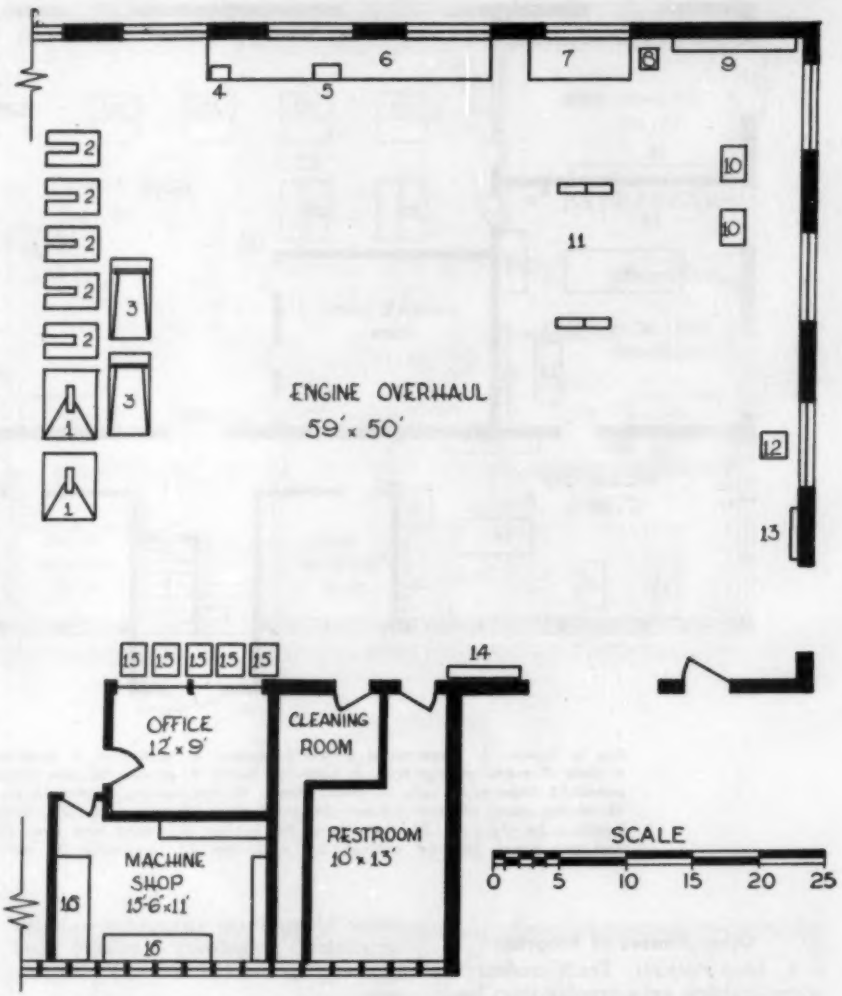
Placement of Graduates

Southern's vocational department provides placement service for those who receive diplomas for completion of full courses. Those who take only one or two quarters must find employment in shops on their own. Those who fail to complete the total course are not recommended for placement. Shop vacancies are reported in and available candidates are referred. The four-year vocational graduates find placement through the teacher placement bureau. Southern is finding that enrollments are leveling off in line with placement outlet and every effort will be made to limit students to trade needs.

Some Final Conclusions

Following eight years in trade education Southern can draw these conclusions:

1. Since trade education is expensive to operate only a very few colleges should establish such a department.
2. Vocational training and teacher training go hand in hand, nicely complementing each other.
3. Southern's vocational students who are high school graduates are eligible for student activities and are encouraged to participate for cultural reasons.
4. Vocational training provides splendid training for many handicapped young people under rehabilitation programs.
5. Call for vocational trade training appears to be in this rank order: auto mechanics, radio-TV, body repair, wood trades (cabinetmaking, carpentry, upholstery), drafting, refrigeration.



Key to layout: 1. Two portable cranes; 2. five engine repair stands; 3. two bay lifts; 4. three-ton press; 5. bench grinder; 6. workbench, large; 7. workbench, small; 8. seventeen-ton press; 9. tool rack; 10. engine dynamometer; 11. car hoist; 12 arc welder; 13. hand washers and dryers; 14. toolbox rack; 15. five portable workbenches; 16. boring, grinding and sizing equipment. — Layout by Richard Stammer

A WORD ABOUT THE COLLEGE DEGREE

EVERETT R. MILLER
Dunwoody Industrial Institute
Minneapolis, Minn.

Several months ago I attended a banquet given by and for about 125 vocational and trade school men. Present were teachers, department heads, supervisors, engineers, and at least one school director. A number of five- to ten-minute talks were given, some very good and some not so good. One of the talks came from a man who is, without question, a very good teacher as well as an excellent tradesman and mechanic. I have known him for several years and greatly respect his trade knowledge and ability. His talk centered around "Sheepskins," and the gist of his remarks was that "one trade-school certificate is worth a wheelbarrowful of sheepskins."

That is, of course, one man's opinion. Nearly all high schools and colleges issue diplomas as evidence that the recipient has completed certain prescribed courses of instruction, and performed certain tasks to the satisfaction of the officials of the institution. With scarcely an exception, all persons who have earned one or more college degrees are the possessors of one or more diplomas. Doctors, lawyers, ministers, scientists, engineers, teachers, and others hold college degrees and possess certificates or diplomas. A former director of one of the nation's outstanding trade schools is the possessor of not less than six college degrees.

Although merely having a college degree does not necessarily mean that its owner is any brighter, or more capable, or more useful to society than certain other individuals, there are some valuable considerations to be noted. Any person who has the desire, the ability, the ambition, and the courage to go through with what it takes to earn one or more college degrees, merits at least the respect of even the firmest skeptic. Surely such a person is more entitled to praise or some other reward than the individual who takes just enough college courses to please his "boss" or to be classed as a "college man," then peters out and quits.

One who has not actually experienced the hard work, the long hours of study and research and the headaches encountered in performing the never ending tasks in earning a degree or two, knows very little about the process. Also, it is doubtful if he is qualified to

appraise the value of a college degree, either intrinsically or theoretically. Who can say that one trade-school certificate is worth more than a wheelbarrowful of "sheepskins"? What sort of measuring stick was employed in reaching this conclusion?

The high-grade mechanic who holds a trade-school certificate deserves much credit and respect for his efforts and accomplishments. His rough and calloused hands are not to be looked upon with scorn by any means. Likewise, his trade certificate and his calloused hands do not necessarily indicate that he is brighter, more capable or more useful to society than the holder of the college degree. It seems to me that it all depends on the man and the use to which he puts his ability, his knowledge, his training and his skill. Let's be fair in our appraisal of both those who have and those who have not a college degree. The world needs and is making good use of both.

SCHOOL PLANT AND EQUIPMENT

DAVID PEYTON

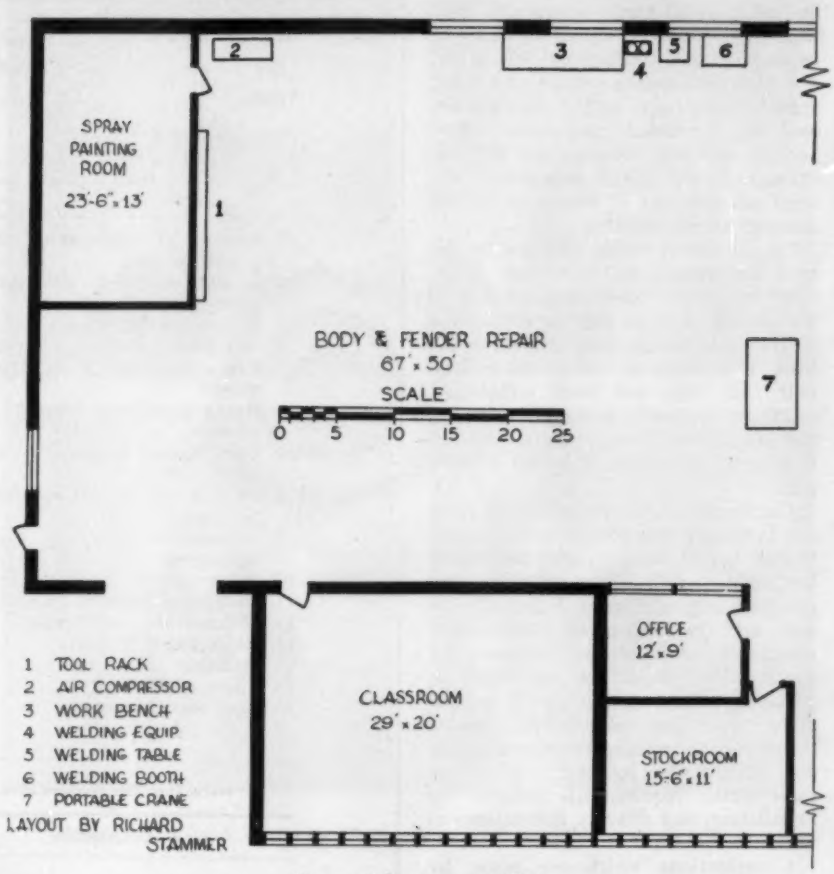
Division Avenue High School

Levittown, N. Y.

If a person decides to buy a going business, he should have criteria by which to judge the value of his purchase in dollars and cents. If he decides to start a business, he must use similar criteria which will enable him to choose both wisely and economically that which he needs to achieve this aim successfully. In industry it is common practice to justify any purchase and to base that justification on adequate data. It is important that the shop teacher be responsible for keeping his shop modern and up-to-date in so far as machinery and equipment are concerned. In this area the instructional needs should be the first criteria employed in the selection of the machinery, equipment, and hand tools, which are necessary for the successful achievement of the stated objectives of a particular curriculum.

The teacher must evaluate that which he is about to do, and he must judge whether or not his selection of a given unit of equipment satisfies criteria which have been established. These criteria should not be construed as being exhaustive or conclusive; however he must begin somewhere.

Adequacy of modern equipment insures a continuous flow of students who have received training which is correlative to current industrial practices and meets the needs of individuals from all walks of life and all levels of the community.



(See article on page 88)

Following a sound approach to good shop planning, an alert shop teacher will constantly check his own program to insure the success of a well-developed curriculum. He will recognize that if a given situation is good, it should be continued. If it is poor in places, these weak points should be corrected. Certainly there is a similarity between the industrial-arts shop and industry and business, which is a determining factor to be capitalized upon. This should be recognized by supervisory administrators, the advisory committee, the principal, and the teacher.

Objectives and requirements should be determined in order to eliminate those types of machinery which are either inappropriate or inadequate, after which, cost factor should be considered. The duplication of industrial conditions requires serious study. Much machinery and equipment today is highly specialized and complex. Therefore we must insure that our equipment selections offer not only the best opportunities for safety practices but that they be adequate for specific operations that are to be taught. This equipment should be of such construction that it is not only typical of a trade but must be equipped with all standard attachments and accessories if we are to be able to give the community the best possible type of program for the amount of money it is willing to spend.

An effective approach requires that we break down each unit into a recognizable form on a basis of comparison. It is all too easy to overlook specific advantages and disadvantages of one unit as against another unit. This comparison check list makes it possible for business offices, the purchasing service, or the individual responsible for selection of such units to thoroughly investigate all of these factors which will insure getting the best possible equipment after a careful investigation. A reliable comparison chart assists the individuals responsible for this selection to make the best choice possible; defines clear-cut conditions for the acceptance or rejection of a unit of equipment and eliminates possibilities of misunderstanding. The elimination of potential misunderstanding is not achieved by clairvoyance, but through the effective co-operation of all teachers who are responsible for ordering machines and equipment. These individuals must remain occupationally competent

and alert at all times in order to deal with these problems. If all elements of industrial arts, vocational education, and general education are to be integrated successfully, let the shop teacher lend his vocational competence where he can to help develop an attitude throughout the school sympathetic toward all divisions of education in the interests of all children.

Let us clearly define and justify the need for specific machines and equipment by stating adequately what it is we require. Let us not forget how a well-written specification can serve us. First it enables us to eliminate any unit that does not meet established standards. Secondly, it allows for impartial inspection of many units; thirdly, it prevents substitution by an inferior unit.

Catalogue specifications in most cases are favorably disposed only to a particular manufacturers' unit and allow for many faults. They offer for inspection only the good features of a unit, and their vagueness makes them unsuitable for intelligent decisions. All specifications should be submitted in paragraph form and should include style, type, size, attachments, power requirements, material, construction, finish, appearance, hardware, space requirements; requirements peculiar to installation, and delivery instructions as well.

Contributions which are made by advisory committees composed of leaders in industry can provide practical co-operation in decisions affecting industrial arts and vocational education programs. These will enable school representatives to develop curricula that will adequately meet the needs of its pupils and of the community.

A sample comparison chart is offered which can assist responsible individuals in establishing check lists to meet their needs.

Item description.....

Style.....Power.....Volts.....

Vendor.....Estimated delivery.....

.....Date checked by.....

.....Department.....

Factors	*G**	*F**	*P**	*Remarks*
1. Number of skills which can be taught.				
2. Is unit equipped with standard safety devices?				
3. Is construction rugged?				
4. Is construction typical of trade?				
5. Can a trade-like produce be produced?				
6. Has it a sufficient range of operations?				
7. Does it meet requirements at low cost?				
8. Does it contain all standard attachments?				
9. Original cost ..... capital investment				
10. Power cost				
11. Installation included or not.....				
12. Maintenance and repair.....				
13. Replacement of parts.....				
14. Probable life				
15. Space requirements				
16. Approximate number of times used.....				

Items That This Machine Is to be Compared to On the Chart

Item Description	*Source*	*Phone*
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....
.....	.....	.....

*G — Good, F — Fair, P — Poor.

A CLAMP RACK

ALFRED E. OWENS

Formerly Industrial-Arts Instructor

High School

Englewood, Kans.

The problem of clamp storage has been solved in our woodworking shop by the construction of this multiple purpose clamp rack. It not only furnishes a convenient storage place for bar clamps but also hand screws and "C" clamps. This unit is located near the gluing area.

This type of clamp rack not only furnishes adequate clamp storage, but also serves as a storage space for seldomly used pieces of equipment. The rack is mounted on 4-in ball bearing casters which provides for easy movement away from the wall and allows storage space behind the rack.

The clamp rack

The construction of this rack is simple and economically framed out of used 2 by 4's and covered with ¼-in. plywood. The shelves and base are made of 1-in. material on a 2 by 4-in. frame. The bar clamps are hung from a piece of ¼-in. boiler plate 6 in. wide with notches in it to accommodate the hanging of the clamps. This plate is bolted to the top of the clamp rack. The bottom end of the clamps are held away from the front of the rack by a support which is located to accommodate various lengths of clamps. Space has been

provided for the hand screws and "C" clamps by bolting 1¼-in. pipe flanges, into which are screwed short lengths of pipe. These pipes may be located on either end of the rack depending upon the desired location of the rack in the shop.

EXCHANGE UNIT BETWEEN SHOP AND HOMEMAKING CLASSES

JAMES CRAWFORD
Industrial-Arts Instructor
High School
Grand Ledge, Mich.

An exchange between shop and homemaking proved to be a most satisfactory instructional unit in the Grand Ledge Public School, Grand Ledge, Mich. It gave boys an introduction to basic cooking as well as permitting girls to learn the use of the common hand woodworking tools and simple construction.

Prior to going into the shop, the girls, with the assistance of the homemaking teacher, did the preparation for projects which consisted of pan dividers and spice shelves for the school homemaking kitchens. The need was recognized for the projects, cupboard measurements were taken, and deciding upon the placement of dividers and shelves, were all part of the student preplanning for the unit.

The boys were orientated to the Exchange unit by discussing in shop prior to moving into the homemaking room, the need for boys and men to know the simple principles of cooking and kitchen management. All the boys were most enthusiastic when told they would actually prepare foods which they would then be permitted to eat.

In the shop, the girls were shown as a group the common wood finishes along with the necessary woodworking tools which should be in the average home basement or garage workshop. Lumber was then issued the following period since sketches were prepared while the girls were still in the homemaking room. (Some of the girls' sketches would make some boys who had shop previously, hang their heads in shame!) From then on, a large portion of the teaching was done on an individual basis since the size of the group and varying progress of students permitted instruction of this type.

Group demonstrations were given on proper use of the hammer, crosscutting saw, speed drill, countersink, and reading of the steel rule, gluing, hand sanding, mixing and applying paint, and applying wax.

Due to the limited time and scope of the projects, the lumber was issued to the girls, ripped on the power saw to the correct width, leaving the correct length to be cut by the girls with the handsaws. Since this ripping would involve considerable extra time for the instructor, it was found that students in advanced shop courses were most willing to give their study hall time to assist in the ripping and other preparation during the girls' class period, thus freeing the instructor to give more individual assistance where needed.

The exchange was carried out for 10–45 minute periods, 3 times a week between 10th grade girls and 8th grade boys. The unit was an experiment in our school system. Stemming from the exchange came several suggestions worthy considering for planning another year — also which might be helpful to the reader:

1. The time should be extended to possibly 15 hour-long periods. It was found the 10–45 minute periods was sufficient for the boys, but insufficient for the girls.

2. It was felt that perhaps the exchange should be made between 12th grade girls (since this group would be most ready for home maintenance) and 10th grade boys. Twelfth grade boys would be more satisfactory but at this school woodworking is offered only up through the 10th grade.

3. The exchange suggested a need for a semester course in household mechanics for girls and a semester course in homemaking for boys which would run concurrently in lieu of an exchange unit. Here again, the 12th grade is suggested for both boys and girls.

4. Finally, it was found that the exchange unit can be a well needed, *shot in the arm* to students who seem to be suffering from *midyear interest lag*.

Students at work in the exchange units at Grand Ledge High School

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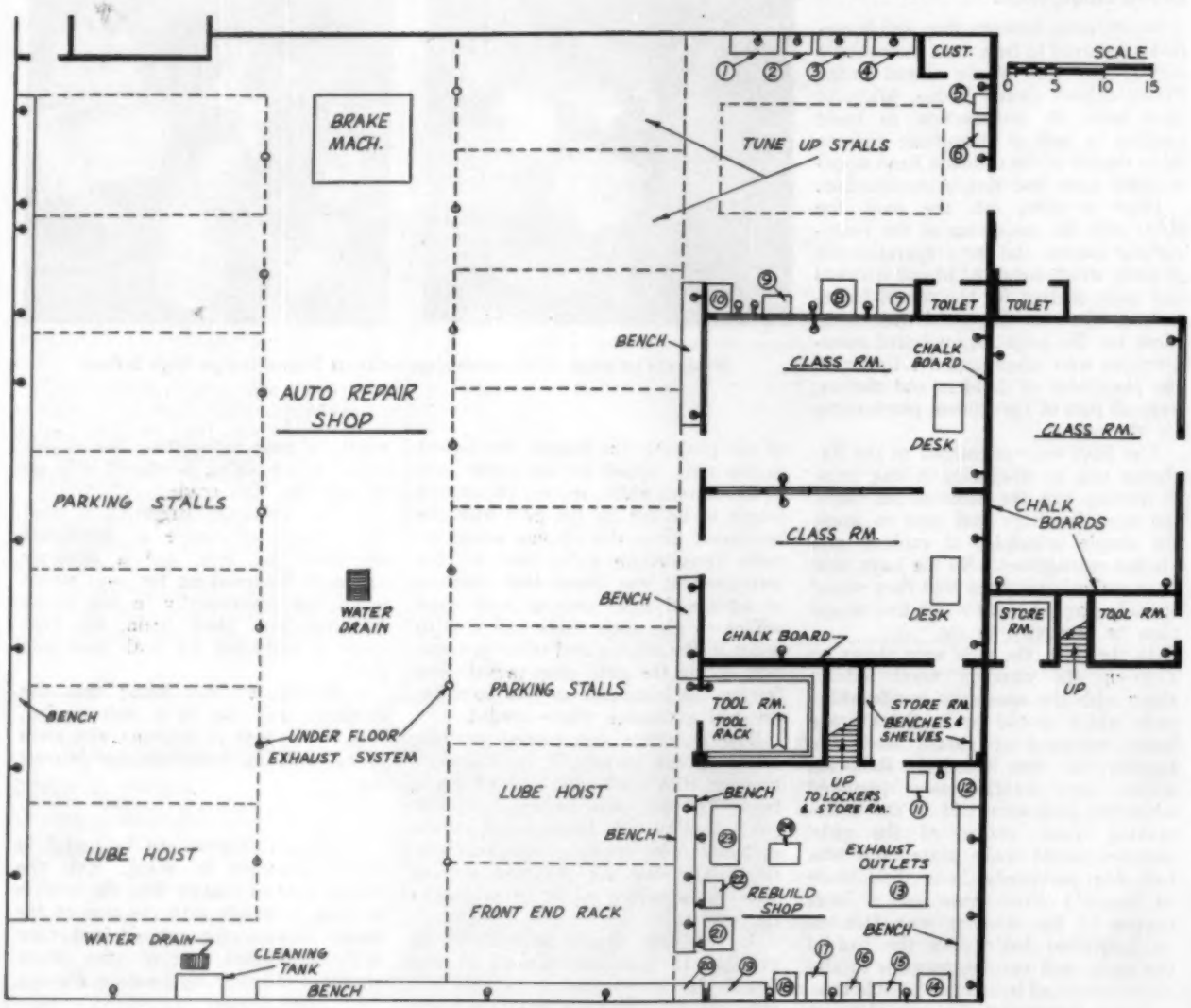
Children's crayons can be useful in fixing scratches in wood. Rub the proper colored crayon into the scratch so that it blends with the rest of the wood. Smooth the surface and then apply a thinned coat of pure, white shellac. — *Shellac Information Bureau.*

Anhydrous ammonia fertilizers, made from petroleum, have stepped up corn yield from 26 to 107 bushels per acre, and raised spinach production 60 per cent. — *Petroleum Newsnotes.*

Tacoma Vocational School Addition

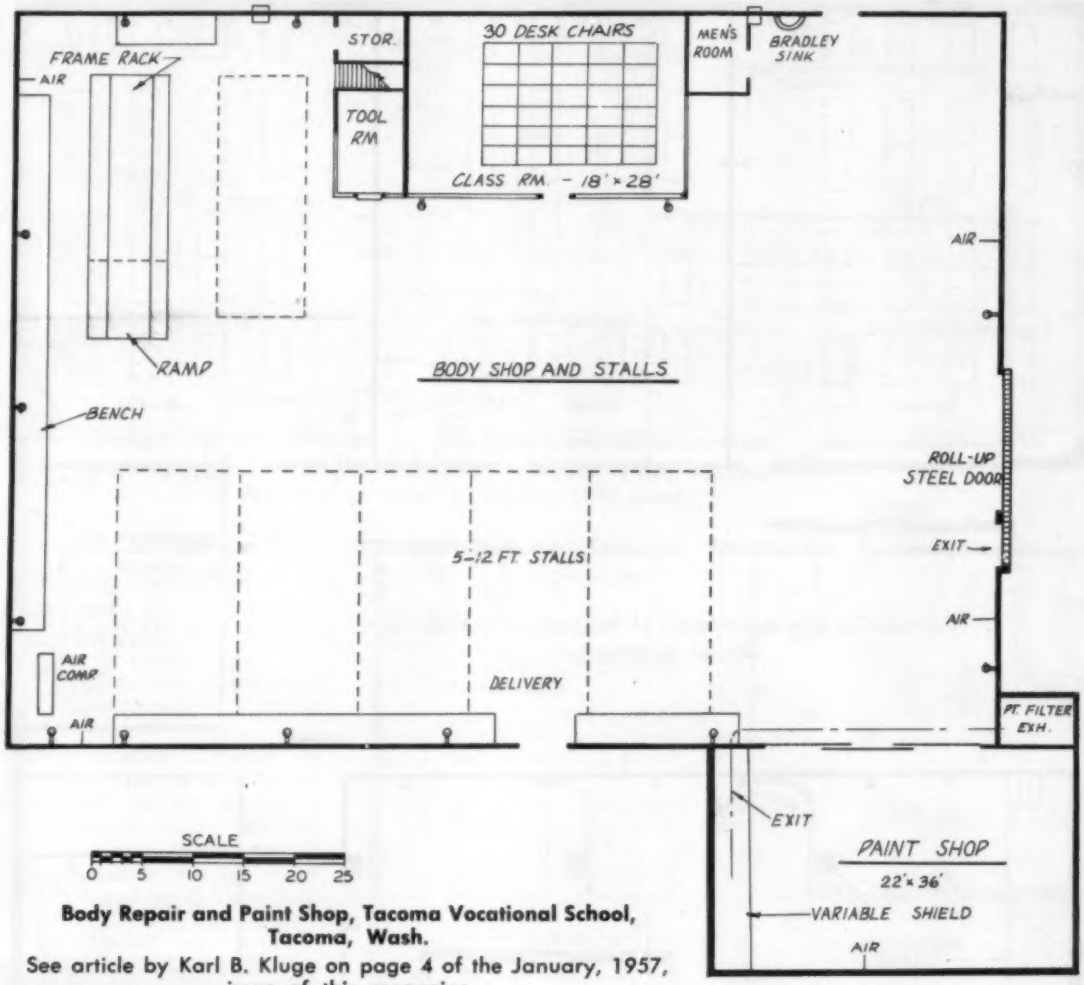
KARL B. KLUGE
Acting Administrative Director of
Vocational Education
Public Schools
Tacoma, Wash.

Plans for the main floor and the ground floor of the Tacoma Vocational Technical School, together with the architect's perspective of the new addition are part of Mr. Kluge's article on page 4 of the January, 1957, issue of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. Please refer to that number of the magazine for the complete story.



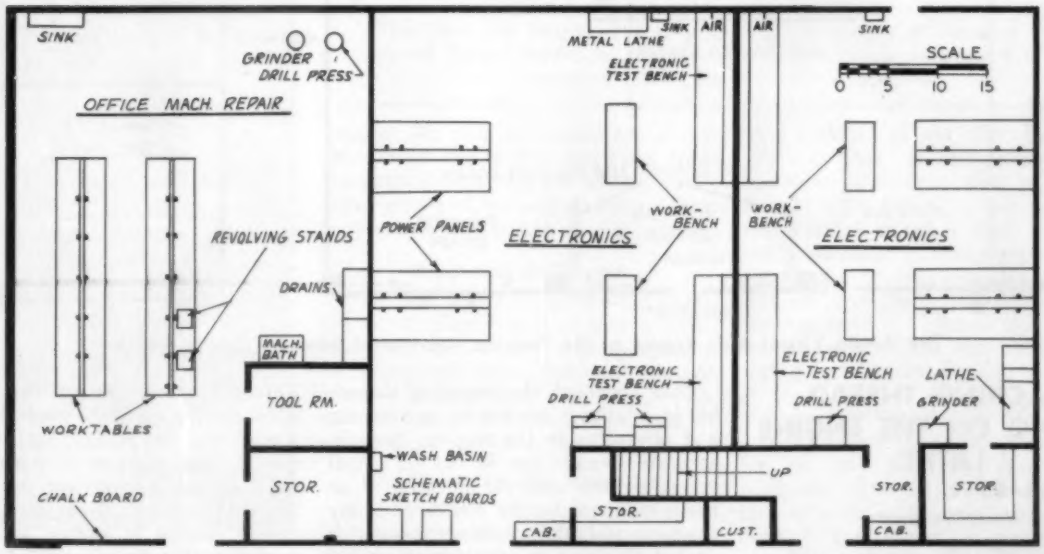
AUTO REPAIR SHOP

1. Workbench; 2. sun tester; 3. workbench; 4. Allen analyzer; 5. grinder; 6. sun tester; 7. generator tester; 8. generator tester; 9. distributor tester; 10. plug tester; 11. drill press; 12. honing machine; 13. engine stand; 14. piston grinder; 15. grinder lathe; 16. grinder; 17. shoe grinder; 18. rack; 19. drum grinder; 20. boring bar table; 21. brake riveter; 22. valve grinder; 23. hydraulic press; 24. table

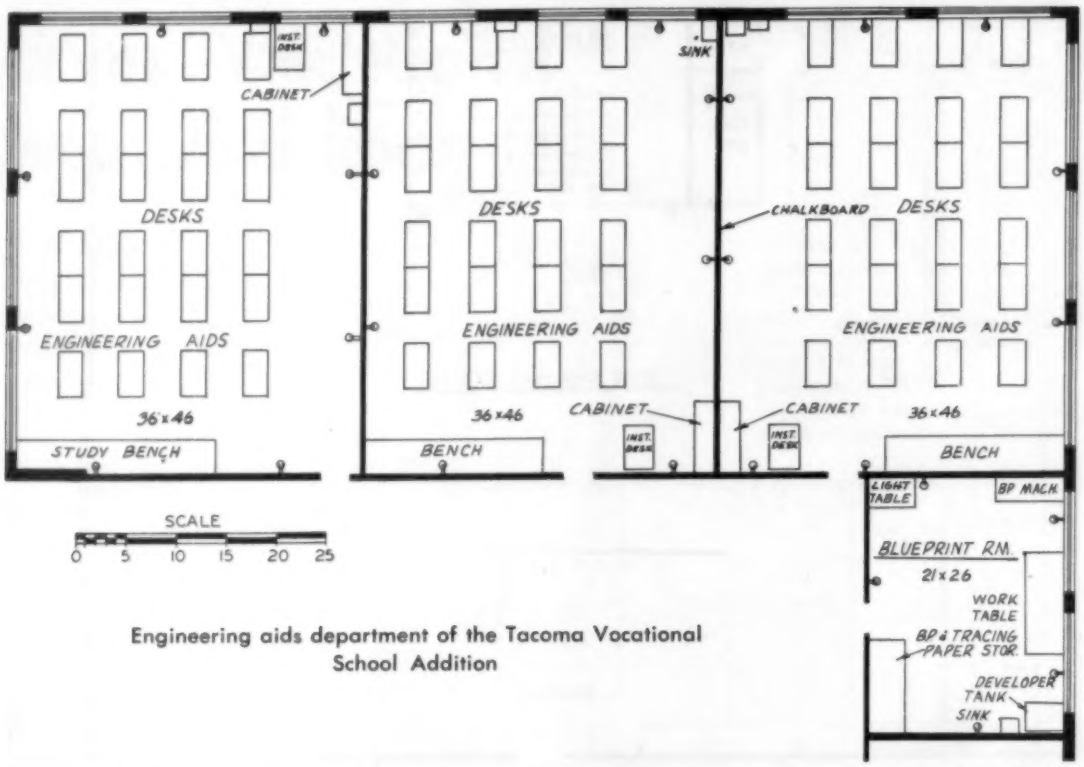


Body Repair and Paint Shop, Tacoma Vocational School, Tacoma, Wash.

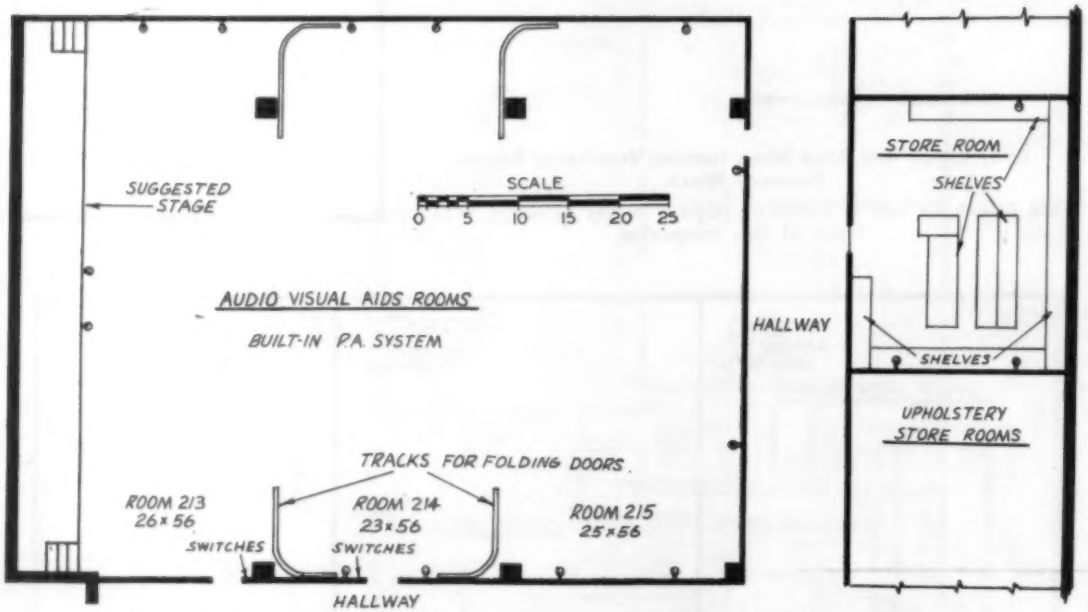
See article by Karl B. Kluge on page 4 of the January, 1957, issue of this magazine



Office Machine Repair and Electronics Divisions at the Tacoma Vocational School Addition, Tacoma, Wash. Karl B. Kluge, Acting Administrative Director of Public Schools



Engineering aids department of the Tacoma Vocational School Addition



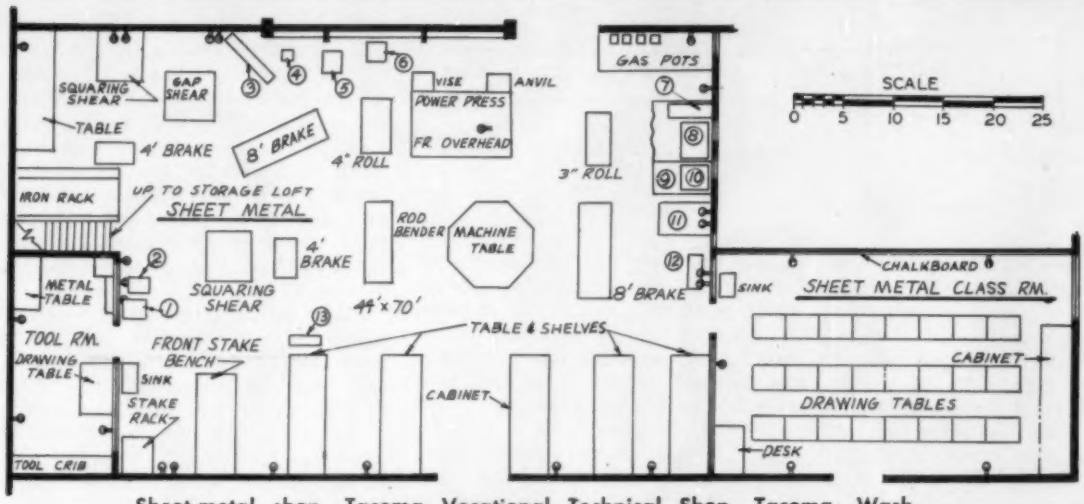
The Audio Visual Aids Rooms at the Tacoma Vocational School, Tacoma, Wash.

TEACHING THREAD CUTTING ON THE ENGINE LATHE

GLEN M. LARSEN
Vocational Machine Shop
Santa Ana College
Santa Ana, Calif.
(Now in Philippine Islands as Machine Shop Instructor)

Once mastered, the process of threading in a lathe is fascinating to students and rewarding to the teacher. Smooth, accurate threads *can be cut* on school lathes *by the students* in spite of so much evidence to the contrary. Many teachers feel that cutting threads is one of the most troublesome facets of teaching machine-shop operations.

Every worthy textbook on the subject of machine shop has a section on *Thread Cutting*. Most of the textbooks agree on the methods used to produce a good accurate thread, but, few if any mention the troubles that are encountered by the learner and the remedies for the troubles. Most instruction for thread cutting is written with the assumption that the operator is going to be using a heavily constructed, accurate, machine tool and that he has all day in which to do the job. School

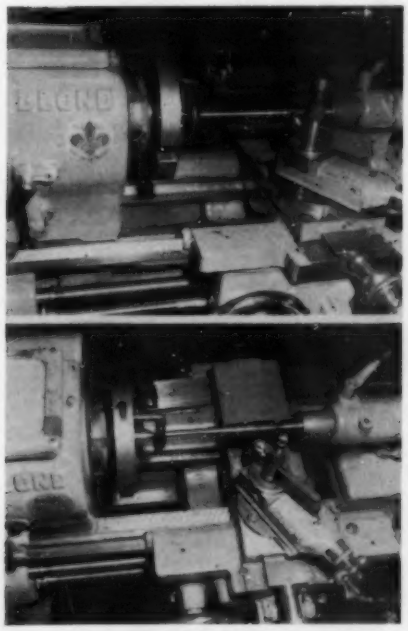


Sheet-metal shop, Tacoma Vocational Technical Shop, Tacoma, Wash.
See article on page 4, January, 1957, issue

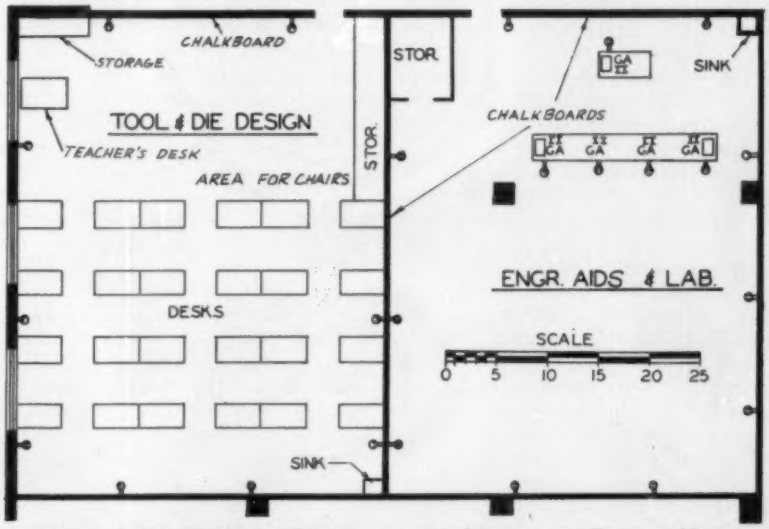
THREAD CUTTING

teachers must teach thread cutting on lightweight, worn out, lathes that are barely capable of doing a good job of plain turning and they must teach the operation in increments of 40 or 50 minutes per day.

The method described here eases the cutting pressures on the lathe and gives both the machine and the student a better than even chance for success. This writer has found that beginning students can be taught how to thread in a very short time after learning how to turn cylindrical work to size between



Practice piece being threaded in the lathe. The tool is in the clear



Tool and Die Design and Engineering Laboratory at Tacoma Vocational School Addition, Tacoma, Wash. See article on page 4 of the January, 1957, issue of this magazine

centers. All that is needed are a few key points and a few variations from the printed texts that are written sometimes with a closer view to theory than to practical application in our schools.

Preparing to Thread

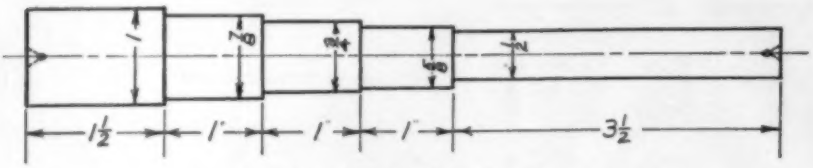
The first operation before beginning the actual threading is to turn a practice piece that adapts well to student threading and makes potential damage from a mistake less disastrous. This piece is turned between centers and is of the shape shown in the sketch.

The Diameters Are Important

A brief check of a few commercial bolts will disclose the little known fact that bolts are always about .002" undersize. This will rarely be found in any textbook. If a thread is to be cut to fit a commercial nut, the clearance of .001" or .002" is very necessary and useful to a student who is going to have a little difficulty, even under the best conditions. It is hard enough to teach a student a new operation without setting up requirements that large manufacturers find difficult to maintain. Impress upon the student that he must use actual bolt sizes and pitches if the thread he is cutting is to fit a nut.

Grinding the Tool Bit

The angles at which to grind the tool bit are very well described in most textbooks. The back rake should be zero. The clearance should be 8 to 12 degrees. But, here is where we differ, after the tool bit is ground to fit the 60 degree gauge exactly, do one more thing. Grind a little *positive side rake*



Practice piece for thread cutting

about 5 or 10 degrees. This will change the apparent tool angle of 60 degrees included angle to something less than 60. Don't let this worry the student. Only one side of the tool bit cuts if it is set according to the directions that follow. A great many machinists make sure that their threading tool has a little positive rake (same as a plain turning tool). If the top of the tool is ground perfectly flat, it will almost invariably lean to the left when clamped into the tool post. (This can be proved by checking the plumb of a toolholder when it is clamped tight in the tool post). If the tool leans to the left, the rake is decreased and may become negative, which is good for cutting brass, but makes threading steel very, very difficult.

Don't overlook the importance of honing a very slight flat on the nose of the tool bit. The theory is to flatten the nose to ⅛ of the pitch. This is fine if the student is able to own a different tool bit for each pitch of thread he cuts. It is also fine if the shop is equipped to measure a flat of 6 or 8 or 12 thousandths of an inch on the nose of a threading tool. My suggestion is to draw the tool bit carefully across a medium hone for three strokes and *stop*. The resulting flat will be wide enough to keep the sharp pointed nose of the bit from breaking down and little enough to cut reasonably fine threads.

Don't Let the Student Hone the Cutting Edges!

Beginning students rarely have the ability to do a good job of honing a tool bit. They wobble the angles all over the oilstone and round the cutting edges to such a degree that they are useless. A well-ground tool bit will cut very effectively for a long time, whereas an improperly honed tool bit will hardly cut at all. The honing to produce a flat on the nose of the threading bit must be done and should be very carefully demonstrated by the teacher so that the clearance angles do not become rounded and lost. All other surfaces should be left as ground. This information is in direct contrast to that usually published in textbooks. It is true that honing a tool bit will increase its effective life and make the finish better. However, industrial-arts teachers must not lose sight of the fact that some of the finer points are better overlooked, until the student has learned to cut metal the simplest way possible. If a student can't grind a tool bit so that it will cut, it is fairly obvious that he won't improve it by rubbing it around on a hone until the shop period ends. The effective life of a tool bit edge in a school shop is usually measured by how long it lasts before it is chipped, broken, or the whole tool bit is lost. None of these factors are improved by honing.

Setting the Work in the Lathe

Mount the practice piece with the lathe dog on the small end so that the threads can be cut on the largest diameter, and the threading tool will run out of the work into the clear. This will eliminate the need for split second timing in backing out the tool bit and releasing the half nut to prevent jamming the tool or gouging the unthreaded part. *See photo.* After the large diameter is threaded (or spoiled) the threads are cut off down to the next largest diameter. This will allow a fresh start on a smaller diameter with the same conditions as the previous trial. Continue in this way until the practice piece is too small to cut threads on, or until two or more good threads have been cut.

Set the Compound Rest at 30 Degrees

When using a tool bit with positive rake, it is imperative to set the compound rest at a 30 degree angle, instead of the 29 degrees advocated by so many instructions. It is hard enough to thread with one side of the tool bit without increasing the problem by trying to cut with both sides at the same time. Be sure that the compound rest is set at 30 degrees to the right of the cross slide center line.

Don't let the student be fooled by the graduations on the rest. There is no standardization on the methods of graduating compound rests. When set at the proper angle, the graduation may read 30 degrees, 60 degrees, or 330 degrees.

Setting the Dials

For maximum rigidity, set the compound rest fully on its slide. Avoiding any excessive overhang either way. Make sure, of course, that there is sufficient travel remaining to get to the full depth of the thread. Set the compound dial at zero by turning the handle to the right to remove all backlash. Mount the tool bit in the tool post and set the cutting edge neatly to the angle of a center gauge. Disregard the right hand edge of the bit. The 30 degree angle of the compound rest will take care of that. Bring the tool point up to the cross slide until it touches the work, and then set the cross slide at zero.

Make sure that the student understands the importance of backlash in cross slide screws when resetting the cross slide to zero after each cut. If he goes beyond zero and then carefully backs up, he will get an unexplained extra depth of cut. If the cross slide is run past zero, it must be backed a full turn and then brought up to zero again. All infeed is done with the compound rest so that the depth of the thread can be gauged according to formula (¾ of pitch).

Depth of Cut

For beginning students, the depth of cut shouldn't exceed .005 in. per pass when starting the thread. The depth of cut should be decreased to .002 in. after reaching a depth of about .003 in. on the compound dial. As the thread gets deeper, the width of chip increases. A 16 pitch thread will have a chip width of as much as .046 in. It is obviously necessary to decrease the chip thickness as the width increases. With more proficient threaders, the first cuts can be made as deep as fifteen or twenty thousandths. The finish cuts must, however, be made light to get good results.

Some Common Troubles and Their Cause

Thread Won't Fit Nut.

1. Sometimes, due to dull tool bits, the material rolls or swells toward top of the thread. Check the diameter of the threaded piece and see if it hasn't enlarged beyond the size limit of the bolt.

Thread Appears Tapered.

1. The pressures on the work during threading are much greater than when plain turning. This often causes the center of the work piece to bend away from the tool bit.

Thread Is Rough.

1. Cutting threads on steel cannot be done dry. A good heavy duty lubricant must be used. See your charts.

2. One very good lubricant usually available, but a little messy, is white lead and cutting oil. Make a slimy mixture and keep the work wet.

3. Increase the side rake on the tool bit and if possible increase the side and front clearance.

4. Resharpen the tool bit, and don't hone it.

5. Recheck the compound rest setting. It must be 30 degrees to the right of the cross slide center line.

6. Many students forget to do *all* the infeed with the compound rest. If infeed is done with the cross slide, the tool bit will cut on both sides; the chips will interfere, and the work will be a mess.

Thread Is Undersize.

1. If the work was .002 in. under the theoretical size before threading, the depth of infeed on the compound rest must be reduced by ½ of the amount of the undersize.

2. If the width of the flat is not exactly to formula size, the calculated depth will be affected by whatever amount the width is incorrect. If the width is too little, the thread will need to be cut deeper than the formula.

3. Impress upon the student that the proof of a good thread is in the quality of fit to a nut, the smoothness of the finish, and the accuracy of the angles of the sides of the thread.

Selecting the Best Qualified for Carpentry Apprenticeships

W. F. PATTERSON
Director, Bureau of Apprenticeship
U. S. Department of Labor
Washington, D. C.

Among the noteworthy accomplishments in the carpentry trade has been the development of more effective pre-employment tests in selecting prospective apprentices. National and local joint carpentry apprenticeship committees have co-operated with the federal and state employment services in developing these tests which have been extremely helpful to young men in choosing the occupation for which they are best fitted. They also have been invaluable to joint committees, employers, and employment service officers in selecting the best qualified applicants for apprentice training.

The greater effectiveness of the tests used in selecting carpentry apprentices in the District of Columbia has had an important influence in other sections of the country. The same or similar testing systems which test both manual and mental abilities, are now being used in many states and trades. The effectiveness of the system is reflected by enthusiastic letters and reports received by employment service officials from apprenticeship committees and individual employers. For example, the secretary of a joint apprenticeship committee states that "by using the tests we are assured of a much better selection of applicants; and we find the turnover of apprentices much less than it was before." The chairman of another committee states that "money, time, and effort are wasted when an apprentice is not properly tested before he begins his apprenticeship."

"Without such a testing system" an employer says, "we would not be able to turn out the fine mechanics being graduated currently."

"Unless we used the testing system," a representative of another committee states, "we would most likely enter many men into our apprenticeship program who would lack the necessary aptitude and ability."

Lack of aptitude for a trade, as you know, is only one of the many reasons for apprentices leaving before completing their training. Financial considerations play an important part in making an apprentice decide to quit. A study made recently by the Bureau of Apprenticeship's research branch revealed that 23 per cent of the apprentices who drop out before completing their training took other jobs because they needed more money. A large percentage of apprentices have dependents and must, therefore, consider first and foremost the amount of money they can make immediately instead of the skills and technical knowledge they can acquire through training in preparation for a craftsman's career.

Unfortunately, many of the apprentices who leave for better paid jobs obtain only a temporary financial advantage. Most of them would have been far better off from a money standpoint, as well as from the standpoint of skill and versatility, if they had been able to complete their training.

In selecting applicants for apprenticeship, it is important to give careful consideration to their financial obligations and ability to live on an apprentice wage for a few years.

Keeping Pace With Current Practices

In an address at Maine's future apprentice ceremony a few years ago, Secretary of Labor James P. Mitchell stressed the need to re-evaluate our apprenticeship programs to determine if the methods used and the skills taught are "keeping pace with the temper of the times and the requirements of our economy."

The carpentry trade — and all the skilled trades in fact — have been doing a good job in keeping apprenticeship programs in tune with the times; but it is a never-ending task. At almost any time revisions and amplifications of programs are needed to keep pace with training needs.

With the advanced methods and techniques, new equipment and tools being adopted today by construction men, apprentices — and journeymen too — need greater technical knowledge as well as greater versatility than ever before. In addition to providing more extensive practical experience it is necessary, today, to place more empha-

sis on technical instruction supplementing the training on the job. The carpentry union has been helping greatly to meet this challenge by developing and making available for classroom instruction a number of manuals containing up-to-date technical information. No less than 12 manuals, one covering the various jobs performed by carpenters, and other manuals detailing the work entailed in different construction jobs, such as stair building, making reinforced concrete forms, cabinet work, and heavy timber construction, have been issued.

The Trade and Industrial Branch of the U. S. Office of Education is also developing new technical material for use in related instruction. At a recent meeting of the executive committee of the General Committee on Apprenticeship for the Construction Industry, a representative of the Trade and Industrial Branch stressed the necessity of co-ordinating related instruction with the training and experience of apprentices in practical work, and the need of assistance and advice from labor and management in planning the school curriculum.

Every local joint apprenticeship committee should co-operate in every way possible with school instructors in coordinating and planning the related instruction. The value of the advice of local committees to classroom instructors was emphasized in an article that appeared not long ago in INDUSTRIAL ARTS AND VOCATIONAL EDUCATION. "The major strength of the curricula for apprentices," the writer of the article said, "lies in the approval of the apprenticeship committees." He pointed out that instructional material for apprentices must be developed with the same meticulous care that is necessary in the development of a college curriculum. "Engineering advancement, technological development and manufacturing improvement," he declared, "represent a challenge to human intelligence and craftsmanship that can be met satisfactorily only through comprehensive, well organized apprenticeship training programs."

Utilization of Motion Pictures

The increasing use of visual aids in the classroom, especially motion pictures, are helping apprentices to understand in a remarkably short time, many of the technical points and processes entailed in the latest and most efficient methods of construction. Your union is setting an example in the development of films for that purpose. A number of instructional films — many of them sound pictures in color — picturing the various kinds of work in bridge construction, pile driving and other heavy construction, as well as mill work, plywood production, furniture making, and other jobs performed in the various allied branches of the carpentry trade have been produced. Then, too, plans are under development to make action pictures of apprenticeship programs in the carpentry trade, and others. Such pictures will, in time, be produced in every skilled trade. The film picturing the step-by-step procedure in the bricklayer program has been of tremendous value as a public relations device. It is of immeasurable value in bringing about a better understanding and strengthening the support of the general public in apprentice training for American youth. Among the thousands of people who have seen the picture have been representatives of more than a dozen different trades, and — as was to be expected — practically every trade representative said that he would like to see a similar film made in his trade.

Door to "Unlimited Future"

"Apprenticeship Is an Open Door to an Unlimited Future for Youth" is the title of an article in the *Constructor*, in which former carpenter apprentices play a leading role. The article records the findings of a survey of the positions held today by former apprentices. The Associated General Contractors of America, which conducted the survey, sent questionnaires to a large number of construction companies. The first 177 replies revealed that 64 per cent of 173 top officials who started as apprentices — presidents, vice-presidents, owners and part owners of companies — began as carpenter apprentices. The replies also revealed that 81 per cent of 353 project managers, superintendents, and foremen who began their careers as apprentices received their initial training in the carpentry trade.

In all fairness to the other building trades, one may point out that the large number of former carpenter apprentices recorded in top jobs is due largely to the greater number of carpenter apprentices and carpenters. Apprenticeship is an "open door" to an equally profitable career if a man receives his early training in the plumbing, electrical, sheet metal, bricklayer trades or, in fact, in practically any of the skilled trades.

Carpenters outnumber other craftsmen because they are needed in building almost any kind of house or other building. That is not true, of course, in all trades.

A. F. of L. Recommendations for the Future

Among the points stressed in the officers' reports to the A. F. of L. convention was that there are still too many men employed as all-round skilled workers and paid journeymen wages, who have not had the comprehensive training on the job and in the classroom provided by apprenticeship. These men should be given the benefit of further training to assure them of the competency and versatility essential in a skilled trade.

Another point to be mentioned is that a great deal more should be done to equip journeymen and foremen to instruct apprentices in the various jobs performed by craftsmen. A journeyman may be highly skilled as a craftsman but he may be entirely lacking in teaching experience and know-how. Such a man should be given the benefit of a carefully planned program of teacher training. This type of training should be developed and greatly expanded.

Skill Improvement

In formulating apprenticeship standards and establishing up-to-standard apprentice training programs, labor and management have the assistance of field consultants of the Bureau of Apprenticeship and the state apprenticeship agencies. The actual work, however, of setting up and conducting apprenticeship programs is the sole responsibility of those who are best qualified — the workers themselves and their employers. Labor and management also have the assistance of the Bureau of Apprenticeship's field staff in establishing programs to train journeymen, foremen, or workers on any level. But here again the function of the Bureau is limited to advice and recommendations. These recommendations are based on practices and procedures developed and time-tested through experience in the various industries and trades.

The term "Skill Improvement" was adopted by the Bureau of Apprenticeship to designate training programs not limited to apprenticeship but including other kinds of industrial training. Whatever kind of training is decided upon for an industrial establishment, it must be geared to needs. It must be designed for a specific purpose. This point is emphasized in an article which appeared in the *Journal of the American Society of Training Directors*. The article, which is entitled "Training is a Must," drives home the point that training must be based on needs. "Know why each training program or course is set up," the writer says, "and what it is designed to do. Some broad areas where training needs may exist: developing new skills; preparing employees for new assignments; breaking in new employees; providing a reserve of workers to meet manpower shortages.

"The question is not who should be trained but where it is needed. Effective training for all employees includes any or a combination of the following: ap-

prenticeship, upgrading, industrial training for new employees, replacement training for anticipated vacancies due to retirement, promotions, resignations, separations."

The big boom in home building promises to carry on. Commercial building has also continued at a record-breaking rate.

Vocational teachers who are responsible for training have, therefore, a big job ahead to meet the demand for skilled man power in the various branches of the carpentry trade. It is a challenge which they, working together with participating contractors throughout the United States, will exert every effort to meet.

A SIGN FOR DRIVER TRAINING CARS

ROBERT D. HOGAN
Industrial-Arts Department
Kansas State Teachers College
Emporia, Kans.

Recently, at a conference for the trainers of teachers of driver training in Kansas the need for a better means of identifying our training cars was expressed. The reasons why a driver training car should be easily identified are numerous. The following are some of the reasons which led to the development of the sign pictured here:

1. The decals supplied by the American Automobile Association do not show up for a sufficient distance, and cannot be seen at all from in front of the car.

2. Many schools are securing cars from dealers without going through the A.A.A. necessitating some means of identification other than A.A.A. supplied decals.

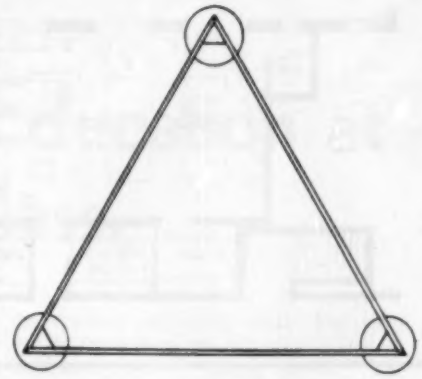
3. The increase of commercial vehicles using door and trunklid advertising has resulted in a lack of attention being paid the automobile using such markings.

4. Some dealers charge the school up to fifty dollars to remove the decals and repaint the doors and trunklid when the car is returned for exchange.

5. A removable sign is very desirable in instances where the car is used for any purpose other than driver instruction. Very often the car is driven by some one other than the driver training teacher. We as driver trainers are reluctant to have our label on the car if the car is driven in a manner not to the credit of our work.

6. The triangular design used at Emporia State College makes identification of the car possible from any direction up to 200 feet away.

7. The entire sign can be made in



any school shop in no more than three clock hours and at a cost of not more than two dollars for materials.

Some hints for constructing the triangular sign:

BILL OF MATERIALS

No. of Pcs.	*Material*	*Size*
3	¼-in. Masonite	4½ by 28 in.
1	Pine	2 x 2 x 18 in.
3	Suction cups — auto supply	
3	No. 20 Machine screws — ¼ in. x 2 in.	
12	No. 8 by 1-in. f.h.b. wood screws	

1. Secure three strips of ¼ by 4½ by 28-in. tempered Masonite.

Driver-training sign attached to top of car

2. Adjust the ripsaw blade to 30 deg. from vertical and convert a 2 by 2-in. piece of pine 18 in. long to form the corner posts. See the illustration.

3. Fasten the Masonite strips to the triangular corner posts with screws using two at each end of the strips.

4. Drill a $\frac{3}{16}$-in. hole $1\frac{1}{4}$ in. deep into the bottom end of each of the three corner pieces.

5. Secure three ¼ by 20 stove bolts and screw one into each of the three holes drilled in step No. 4.

6. Leave $\frac{3}{4}$-in. of the threads exposed, then with a hack saw remove the heads from the three bolts.

7. The suction cups are available from most auto supply stores. The cup is threaded for the stove bolts and as soon as your sign is painted you need only to tighten the suction cups onto the studs and your sign is ready to install. Black or red lacquer make good background colors. If spray equipment is available lacquer can be used to advantage by spraying white lacquer through a stencil for the letters.

Some teachers have expressed the belief that the wording on the sign should be *driver education*. The writer feels that the part of the course taught in the car is driver training. The wording is a minor point and should be what the individual teacher wants. The colors can be varied; some may want to use Scotchlite or some luminous type material in order that the sign may be effective for night time driving.

SHOP LAYOUT FOR ADDITION TO DEFIANCE HIGH SCHOOL

LESTER RIGGLE
and
LARRY MANAHAN
Industrial-Arts Department
Defiance High School
Defiance, Ohio

Industrial arts at Defiance High School is a part of general education, and with this in mind constant changes are being considered to provide the students with a better industrial-arts education. The industrial-arts department has four full-time instructors who handle a total of 300 students each day. Our present program provides the following for those in grades 7 through 12.

The junior high shop provides beginning experiences in drawing, wood, sheet and art metal, plastics and basketry.

The ninth grade students are given a more extensive program of hand and machine woodworking for the entire year.

The tenth grade pupils are provided with the required course of drafting,

JUNIOR HIGH ARTS AND CRAFTS

(1) Work bench; (2) Tool cabinets; (3) Pedestal grinder; (4) Kiln; (5) Bench; (6) Buffer; (7) Blue clamps; (8) Scroll saw; (9) Drill press; (10) Soldering bench and equipment; (11) Lapidary tools; (12) Sheet metal bench and tools; (13) Shop Smith; (14) File cabinet; (15) Belt in Cupboard.

DRAFTING

(1) Work bench; (2) Teacher's desk; (3) Large drafting table; (4) Chalk board; (5) Sink; (6) Storage cabinet for drawings; (7) Cupboards; (8) Bulletin boards.

AUTOMOTIVES

(1) Work bench; (2) Tools cabinet; (3) Hoist; (4) Wash Basin; (5) V-8 motor on stand; (6) Stripped down car; (7) Test equipment (Allen).

FOUNDRY

(1) Molding bench; (2) Gas furnace.

GRAPHIC ARTS

(1) Work bench; (2) Type cabinets; (3) Kurkprint stamping machine; (4) Paper cutter; (5) Filing cabinet; (6) Sink; (7) Bookbinding bench and equipment; (8) Tool panel; (9) Platen press 10 x 15; (10) Pilot press 6½ x 10; (11) Imposing table; (12) Proof press; (13) Steel cabinet; (14) Student lockers and storage; (15) Bulletin board; (16) Sink and cabinets; (17) Enlarger; (18) Teacher's desk; (19) Chalk boards; (20) Stapler.

MACHINE SHOP

(1) Work bench; (2) Locker bench; (3) Arbor press; (4) Milling machine; (5) Bench mill; (6) Pedestal grinder; (7) Engine lathe; (8) Shaper; (9) Drill press; (10) Bench lathe; (11) Tool cabinet; (12) Power cut off saw; (13) Metal cutting band saw; (14) Bench shaper; (15) Surface grinder; (16) Tool cutter grinder; (17) Teacher's desk; (18) Filing cabinet; (19) Book case and storage; (20) Metal storage cabinet; (21) Library table; (22) Book shelves; (23) Drawing and planning table; (24) Main power switch; (25) Light panel; (26) Student lockers; (27) Workbench and storage cabinet; (28) Cupboard; (29) Storage racks and shelves for metal.

FORGING AND WELDING

(1) Welding bench; (2) Electric welder; (3) Flexible shaft grinder; (4) Gas forge; (5) Tool panel; (6) Gas welder; (7) Anvil.

SHEET METAL

(1) Soldering bench and furnace; (2) Tool panel; (3) Sheet metal bench/pan brake and stakes; (4) Sheet metal bench/di-acro bender, slip rolls, comb turning, burning and wiring machine; (5) Squaring shears.

Shop layout for addition to Defiance High School, Defiance, Ohio

that is required if he is to take metals in his junior or senior year.

The eleventh and twelfth grade students are provided with experiences in sheet metal, foundry, gas and arc welding, machine-shop practice, and some experience in electricity and automotives.

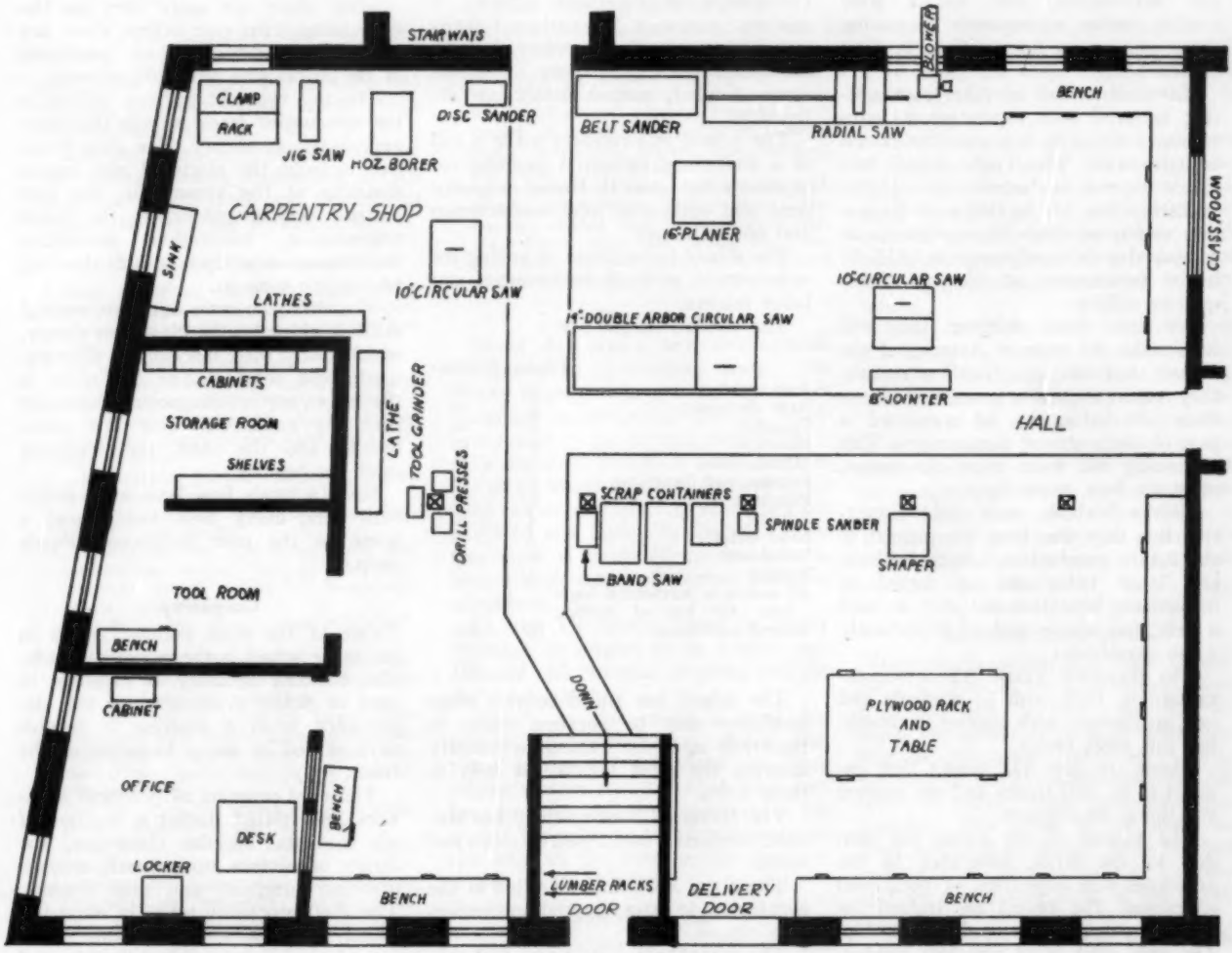
The eleventh and twelfth graders are permitted to take the graphic arts course, as well as the arts and crafts course which provides experiences in wood carving, leather, art metal, lapidary, jewelry, and screen process printing.

Vocational Education at Haverhill, Mass.

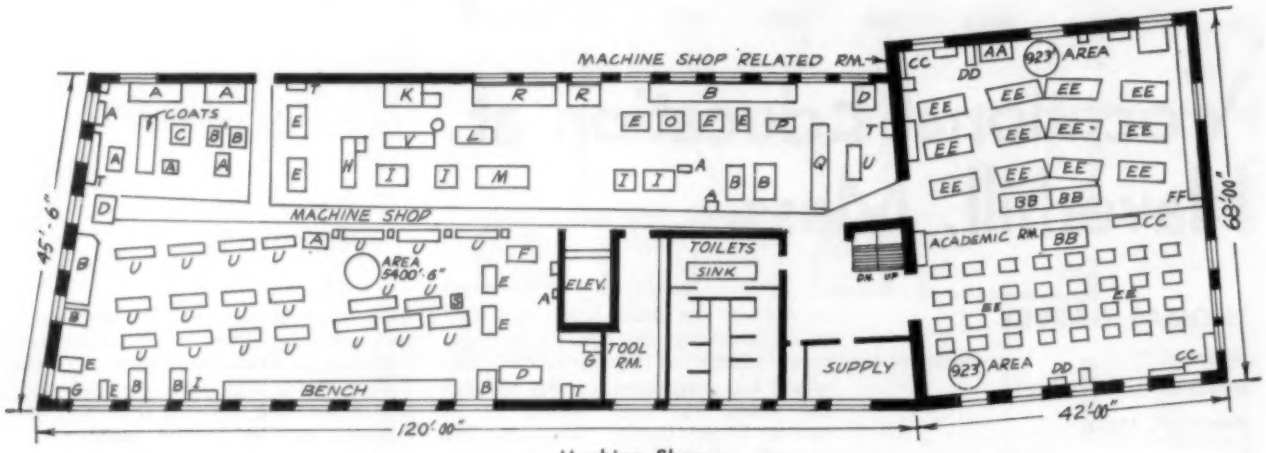
THOMAS GARVEY
Director
Haverhill Trade School
Haverhill, Mass.

The Haverhill Trade School has earned respect in the community through the skill and general good behavior of its graduates. Morale always has been exceedingly high. The pupils as a whole are doing what they want to do, and they are a happy and contented group of young people. The school has progressed steadily through the years. The main reason for its success is the faculty. We have been blessed with men who are capable artisans and who understand youth's problems in and out of school, since they attended our schools and also worked in industry before becoming teachers. They are dedicated to their work. Along with fine instructors the pupils have excellent academic courses. There is a placement service available when they become seniors, and after they graduate. There is a guidance department to which the students can go for assistance with their personal and school problems, knowing that the conferences will be strictly confidential. They have an excellent physical education program. Few displays in statewide exhibits could ever compare with the fine work done in the shop departments of our Trade School.

This type of mechanical training plus the related work, which includes mathematics, physics, science, drawing, and academic courses of a type which pre-



Carpentry shop, Haverhill Trade School, Haverhill, Mass.



Machine Shop

Key to diagram: A. grinder; B. bench; C. layout table; D. instructor's desk; E. millet; F. saw; G. file cabinet; H. shaper; I. drill press; J. screw machine; K. furnace; L. salt tank; M. radial drill; N. anvils; O. sand blaster; P. buffer; Q. planer; R. forge; S. oil; T. tool rack; U. lathe; V. screw machine

Machine Shop Related Room

AA. blueprint cabinet; BB. instructor's desk; CC. books; DD. file cabinet; EE. students'desks; FF. bench

pares these young men for good citizenship, trains them to look up and use information, and instills good reading habits, adequately preparing these young men for positions in their chosen fields.

Haverhill as well as other communities, is faced with expanding its education facilities. It is a condition which is nationwide. The Trade School will either expand or become very highly selective. The U. S. Office of Education estimates 1956–57 enrollments as compared with enrollments in 1955–56 to be an increase of one and three-quarter million.

We want these children; they will help make the stronger America of the future; but like all "raw" materials, they require expensive processing before their full value can be accounted a part of the assets of this country. This processing will mean more classrooms, more teachers, more supplies.

George Peabody once said, "Education is a debt due from the present to the future generations." Both business and labor today are on record as recognizing education not only as such a debt, but also — and all importantly — an investment.

The Haverhill Trade School was organized in 1926 with 32 students and two instructors, with courses in plumbing and sheet metal.

There are now 552 young men enrolled in 11 unit trades and one general vocational department.

The success of the school has been due to the strict adherence to the principles and objectives of vocational education. The pupils are trained for gainful employment and citizenship. The shop work is all practical, productive work.

The school personnel, at present, consists of 1 director, 1 assistant director (in charge of placement service), 1 guidance counselor, 9 department chairmen, 22 instructors, 1 secretary, 1 clerk-stenographer, 1 clerk-typist, 4 custodians, 1 chef, and 2 lunchroom attendants.

The school was recently made a gift of a four-story industrial building for expansion by Louis H. Hamel, a prominent and successful local businessman and philanthropist.

The school is fortunate in having the endorsement of local businessmen and labor leaders.

The courses taught are:

	Classes	*Students*
Auto repair	4	60
Basic electronics	2	40
Carpentry	2	40
Electrical	2	40
Machine shop	2	40
Painting and decorating	1	20
Plumbing	1	20
Printing	2	40
Sheet metal	2	40
Upholstery	2	40
Welding	1	12
All seniors in mechanical trade have 100 hrs. of welding		
General vocational	10	160
		552

The school has added courses when necessary due to surveys made in Haverhill and its immediate vicinity showing the need for skilled help in these fields.

The Haverhill Trade School has students enrolled from 22 nearby cities and towns.

There are 200 adults enrolled in the evening trade extension and apprenticeship classes.

The school motto is: Enter to Learn — Depart to Serve.

Automotive Repair Shop

Since there are more cars on the road today than ever before, there are increased opportunities for graduates of the automotive repair department.

The two types of training offered in the automotive trade include shopwork and classroom theory. The shop practice includes the electrical and engine divisions of the automobile, the fuel system, steering and brakes, the power transmission, lubrication, preventive maintenance and tires, trouble-shooting and engine tune-up.

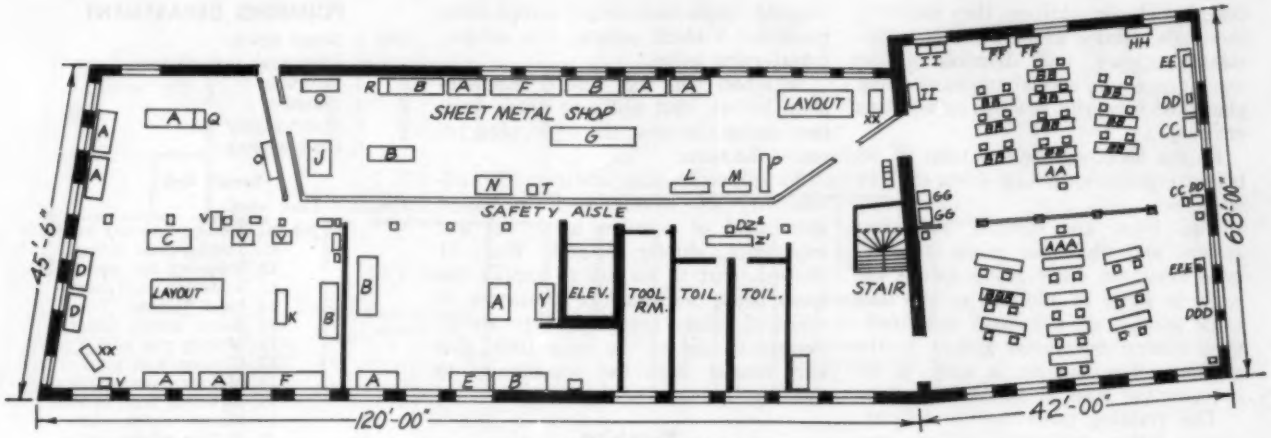
The ability to carry out these manual skills is aided by the classroom theory, which deals with mechanical drawing, math, and science. The classroom is the laboratory for diagnosing the many problems connected with the automobile, and the shop, the operating room for repairs.

Since a boy's first love is to tinker with cars, many boys have found a home in the new automotive repair shop.

Carpentry

One of the most popular trades in our trade school is the carpentry trade. The building industry is urgently in need of skilled craftsmen and this department is in a position to furnish boys skilled in many branches of the trade.

The dual program of practical shopwork and related studies is required of all students. In the classroom, the future carpenters study math, science, drawing, blueprint and plan reading. The shop procedure takes in wood finishing, millwork, tool sharpening, framing, staging, form building, roofing and flashing, roof and stair framing, outside



Sheet Metal Unit Trade

Key to diagram: A. 6 by 3-ft. workbenches, 10; B. 8 by 3-ft. workbenches, 6; C. 6 by 2 ft. 6-in. workbenches, 1; D. 5 ft. 6-in. by 2-ft. workbenches, 2; E. 4 ft. 6-in. by 3 ft. 6-in. workbench, 1; F. 10 by 2 ft. 6-in. workbench, 1; G. bench stakes storage, 1; H. small bench machines, 9; I. vises, 9; J. 5 ft. 6-in. by 4-ft. squaring shears, 1; K. 5 by 1 ft. 6-in. squaring shears, 1; L. 8 by 1 ft. 6-in. hand brake, 1; M. 5 by 1 ft. 6-in. hand brake, 1; N. 4 by 2 ft. 6-in. pan brake, 1; O. 4 by 1 ft. 6-in. hand brake, 2; P. 4 ft. by 4-in. forming roll, 1; Q. 3 ft. by 2-in. forming roll, 1; R. 30-in. bar folder, 1; S. floor drill press, 1; T. floor spot welder, 1; U. floor buffer machine, 1; V. cabinets in shop, 6; X. gas furnaces on wall, 7; XX. instructor's desk, 2; Y. welding booth, 1; Z^1. wash up, 1; Z^2. water buttler, 2

Sheet Metal Related Room

AA. instructor's desk and chair, 1; BB. students' desks and chairs, 20; CC. filing cabinets, 2; DD. storage cabinets, 2; EE. small cabinets, 2; FF. drawing instrument cabinet, 2; GG. drawing board rack, 2; HH. layout table, 1; II. student notebook cabinets, 2

Gas Welding Related Room

AAA. instructor's desk and chair, 1; BBB. students' desks and chairs, 20; EEE. small cabinets, 1; DD. storage cabinets, 2

trim, door and sash work, walls and ceilings, side wall finish, floors, inside trim and stair finish.

The entire course is very fascinating and becomes more interesting as the boys learn their trade and develop an appreciation of fine workmanship.

Carpentry Department

1. Shop procedure: toolroom maintenance; receiving and issuing materials; keeping material lists; making out costs; care and oiling of machines; safety rules.
2. Use and care of hand tools:
   A. Boring tools: bits, auger; bit brace; bit, expansion; countersink; hand drill.
   B. Edge cutting tools: chisel; hatchet; jackknife; planes — block, jack, and rabbet; scrapers.
   C. Fastening tools: hammers; screw drivers; wrenches.
   D. Holding tools: bench vise; clamps — bar, "C," and parallel.
   E. Layout tools: butt gauge; chalk line; combination square; compass (dividers); jackknife; pencil; sliding "T" bevel; steel square; straightedge.
   F. Measuring tools: rules (folding); tapes.
   G. Toothed cutting tools: coping saw; compass saw; hack saw; handsaw, crosscut; handsaw, rip; miter box.
3. Use and care of stationary power tools: drill; horizontal borer; lathe; belt sander; disk sander; spindle sander; band saw; circular saw; radial saw; jig saw; jointer; planer; shaper.
4. Use and care of portable tools: drills; sander; router; jig saw; skil saw.
5. Form work: footings; single wall forms; double wall forms; stair forms.
6. Framing: sub floors; side wall sheathing; roof sheathing; insulation; lathing; bridging; grounds; strapping; ceiling joists; partitions; floor framing; sills; girders; side-wall framing; shed-roof framing; gable-roof framing; hip-roof framing.
7. Outside finish: porch floors; calking; flashing; roll roofing; strip shingles; corner boards; louvers; window frames; door frames; side wall finish; shingled corners; porch rails; snub cornice; open cornice; box cornice; rake finish.
8. Inside finish: linoleum underlayment; wall boards; plank walls (knotty pine); base boards; clothes closet trim; chair rail; finish floors; door trim; ceiling tile; window trim; fit and hang doors; kitchen cabinet installation; stair finish.

Electrical

Every day sees a new development in this most fascinating trade. The steady expansion in this field promises unlimited opportunities and an excellent future to the trained electrician.

In the short period of three years in the shop, would-be electricians progress from elementary splicing, simple wiring, soldering and taping to the more complex tasks of repairing motors, generators, transformers, oil burner controls, telephones, etc.

In the classroom, there is heavy emphasis on related math, science, mechanical and electrical drawing and the electrical code.

Theory in this trade is most important. Experience has shown that those who would get ahead are those students who try to get a thorough background in the fundamentals of the trade. There is as much emphasis on the why as the how in the electrical trade.

Machine Shop

The foundation of industry for the most part is the machine shop trade. This being the case, there are almost no limits to the job opportunities in this trade.

In the machine shop, the boys learn to operate the lathe, milling machine, shaper, drill press, tool and cutter grinder, surface grinder, the power hack saw, cylinder grinder, and the planer. Since machine-shop practice is precision work, a high standard of work is maintained.

Going hand in hand with the shop practice is the work in the related classroom, math, science, machine drafting, and the use of measuring instruments.

Many of our graduates have gone out to make names for themselves as machine operators, tool and die makers, foremen, supervisors, and draftsmen. Some have their own shops. There is always room in industry for young men with ambition, and a knowledge of basic machine shop theory.

Machine Shop Setup

Our machine-shop unit trade department is operated on a three-year basis, with the aim in view, not only to teach the slower boys to become good machine operators, but also to carry the smarter boys sufficiently far in their work, to qualify them to become shop foremen. This phase of the work has been achieved by many, some of them owning their own places of business, and are now hiring some of our graduates.

We not only train the boys in the fundamentals of machine tool opera-

tion, but also in addition, they receive a thorough training in the related mathematics, science, and drawing of the machinist trade, special emphasis being placed on blueprint reading rather than drawing.

In the shop we have a total of 58 training stations, broken down into 19 units.

The boys are divided into two groups, and while one group is in related class the other group spends the week in shop. In addition to two unit trade groups we also have two freshmen general vocational groups in the machine shop making a total of 80 boys on the floor at all times.

The training units are as follows: engine lathe; horizontal milling machine; radial drill; multiple-spindle or precision drill; shaper; planer; cylinder grinder; cutter grinder; surface grinder; small tool grinder; bench work; heat treating; Oliver die filer; sand blaster; polishing lathe; vertical milling machine; turret lathe (hand screw machine); punch press; Do-All band saw and filing machine.

Each training unit is broken down into the following training steps. As space will not permit breaking down all the units I have chosen the radial drill as an example.

Unit No. 3 — Radial Drill: plain drilling; countersinking; counterboring; spotfacing; boring; machine reaming; hand reaming; undercutting; strap setups; drill to a close layout; drawing over a drill point; drilling to a depth; tapping; angle-iron setups; setups using parallels; V-block setups; vise setups; transferring holes.

Attached you will find a machine-shop layout, and although there have been some changes, the basic plan remains the same.

Some people may question the advisability of having such a varied assortment of training units, but our experience during World War II showed, that if we are to supply the local needs for machine operators in event of future hostilities, they are all necessary, and at the same time, give our smarter boys the opportunity to develop into tool and die makers.

Plumbing

One of the very few schools in the state to offer training in plumbing is our own. For 27 years, Earle J. Turner has been training young men in the finer arts of the trade.

In the shop some of the subjects he covers are lead work, piping, lead welding, roughing, finishing, and water supply. Stressing theory as well as practical work, the boys in the classroom study tools, equipment, heating, math, physics, science, drawing, and plan reading.

Industries in our city have always called on the plumbing department to supply much needed trained help. The job outlook in the trade is exceptional. There are always more positions than there are seniors available. The whole school is proud of this department, its work, and its record.

PLUMBING DEPARTMENT

Unit 1. Screw piping
2. Lead work
3. Roughing
4. Finishing
5. Water supply
6. Lead welding

Sample Unit

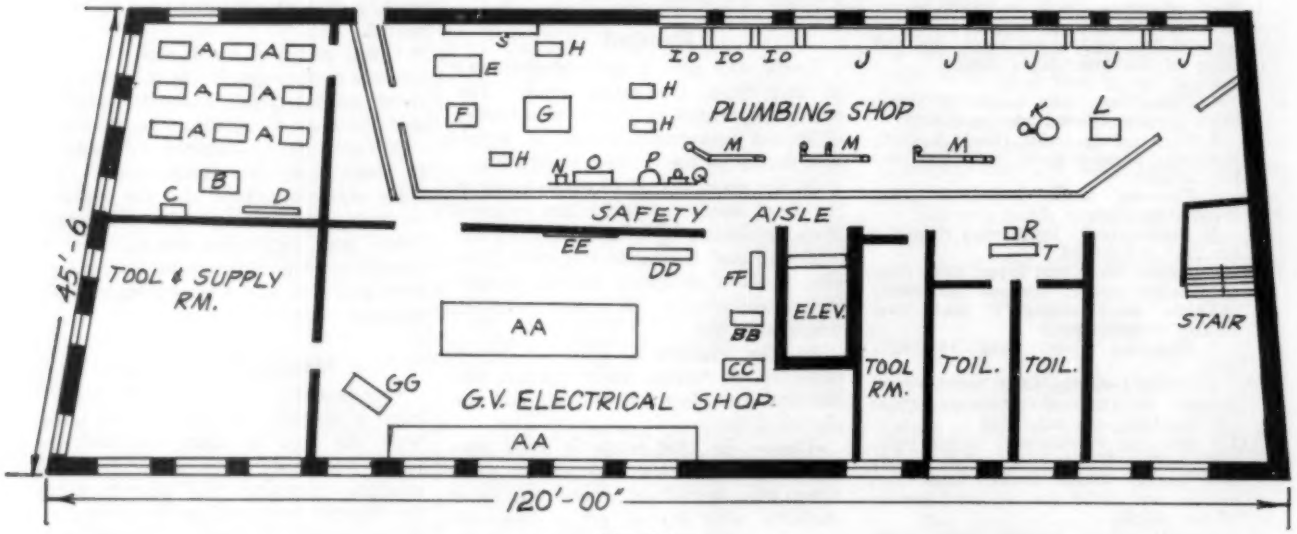
Unit 2. — Lead work
Job 10. Tinning soldering iron
11. Tinning brass fittings
12. Soldering flat seam
13. Soldering angle seams
14. Lead flashings
15. Solder hidden joints
16. Making cup joint
17. Capping lead bend
18. Making overcast joint
19. Soldering brass to lead
20. Mixing wiping solder
21. Making wiping cloths
22. Wiping flange joints
23. Wiping round joints
24. Wiping branch joints
25. Installing lead in a house

Printing

Probably the most challenging trade in the school is the printing trade. New students entering the department first learn hand composition. They begin with straight matter and advance to display composition, tabular and rule, make-up, imposition, and proofreading.

When these skills are mastered, the student continues on to press work, learning the operation of the platen press, cylinder press, and the Miehle Vertical. For machine composition there is the Linotype or the Monotype.

Any talented young man who chooses printing as his vocation, is indeed choos-

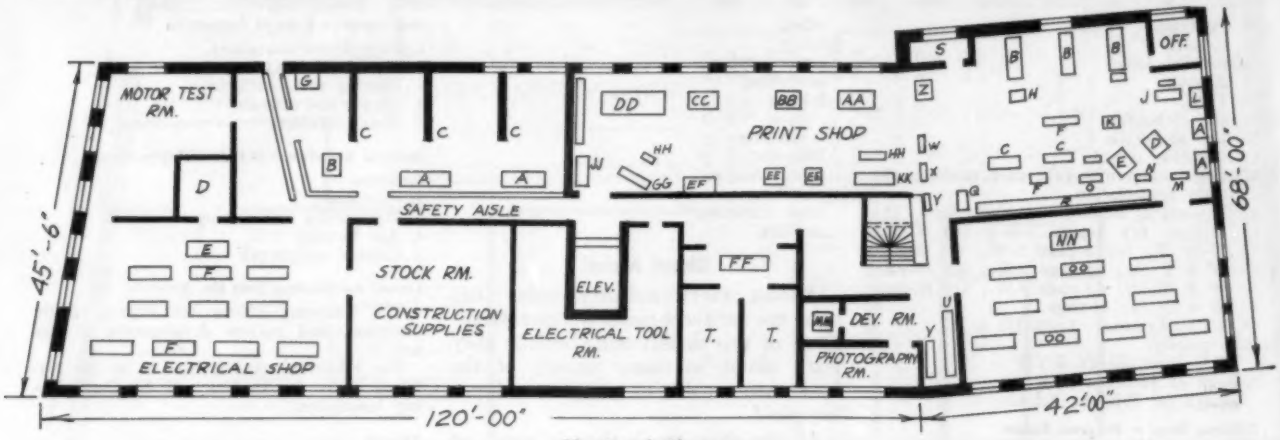


Plumbing

Key to diagram: A. classroom desks and chairs, 9; B. teacher's desk and chair, 1; C. filing cabinet, 1; D. blackboard, 1; E. threading machine, 1; F. electric vise, 1; G. pipe vises, 4; H. vises, 5; I. wiping benches, 3; J. working benches, 5; K. furnace and hot water tank, 1; L. furnace, 1; M. soil pipe roughing, 3; N. urinal fixture, 1; O. bath tub fixture, 1; P. lavatory fixture, 1; Q. water closet fixture, 1; R. drinking fountain, 1; S. pipe rack, 1; T. wash basin, 1

GV Electrical

AA. workbench, 2; BB. grinder, 1; CC. drill press, 1; DD. wood lathe, 1; EE. work panels, 1; FF. buffer, 1; GG. teacher's desk and chair, 1



Electrical Shop

Key to diagram: A. workbenches, 2; B. grinder, 1; C. wiring practice board, 3; D. reference material room

Electrical Related Room

E. instructor's desk and chair, 1; F. students' desks and chairs, 20; G. bake oven, 1

Print Shop

A. Monotype keyboard, 2; B. Hamilton Double Adman, 3; C. stone, 2; D. Linotype Model 8, 1; E. Intertype C3, 1; F. proof press, 1; G. galley storage, 1; H. Hamilton Single, 1; J. Hammond saw, 1; K. Linotype & Intertype magazine rack, 1; L. cut storage, 1; M. Bostich stapler, 1; N. Bostich stitcher, 1; O. National cutter, 1; P. Portland punch, 1; R. bindery bench, 1; S. metal smelting room, 1; T. sorts storage, 1; U. paper storage rack, 2; V. strippinng table, 1; W. 10 by 15 Chandler & Price press, 1; X. 8 by 12 Chandler & Price press, 1; Y. drying rack, 1; Z. 12 by 15 Chandler & Price press, 1

AA. ATF Littlechief Offset press, 1; BB. Miehle V-50 vertical press, 1; CC. 10 by 15 Hiedelberg press, 1, DD. Miehle Pony Cylinder press, 1; EE. Monotype caster, 2; FF. wash-up sink, 2; GG. Cleveland folder, 1; HH. workbenches, 2; JJ. instructor's desk, 1; air compressor, 1; LL. water bubbler, 1; MM. vacuum frame, 1

Printing Related Room

NN. instructor's desk and chair, 1; OO. students' desks and chairs, 20

ing an intriguing trade and one that ranks high in this nation's business.

The time spent in the related classroom is devoted to printing, English, math, drawing, and science. This covers a study of tools, all forms of composition, make-up, presswork processes, paper analysis, binding, and a history of the trade.

The print shop keeps in touch with all the modern trends and sends its boys into industry well prepared to make a name for themselves and their school.

Course of Study — Printing Related

English

1. Sentence structure
2. Capitalization
3. Punctuation: (*a*) reference marks
4. Word study: (*a*) trade terms
5. Spelling: (*a*) abbreviations; (*b*) trade names
6. I.T.U. Unit 5 lessons 1 to 10 inclusive

Proofreading

1. Marks
2. Holding copy
3. Marking proof
4. Use of reference books: (*a*) dictionary; (*b*) office style
5. Type characteristics: (*a*) old style; (*b*) modern; (*c*) composite
6. Editing copy: (*a*) style; (*b*) marking copy

Book and Periodical Reports

Seniors — 4 book reports on printing
Juniors — 1 book report on Benjamin Franklin
Sophomores — 1 abstract from magazine each quarter
Juniors — 2 abstracts from magazine each quarter
Seniors — 4 abstracts from magazine each quarter
Bibliography, I.T.U. Unit 5:
Business English and Correspondence, Davis & Lingham
English for Vocational Schools, Shuman
VII & VIII Grade Speller, Noble and Noble, Prof. Albert S. Taylor, John C. Gilmastia, William Boxlan
Civil Service Spelling List, Civil Service Book
Intercollegiate Dictionary
Magazines: (1) *Inland Printer*, (2) *American Printer*, (3) *American Pressman*, (4) *Book Binding*, (5) *Graphic Arts Monthly*

Mathematics

1. Review of four principals: add — subtract — divide — multiply; math book
2. Paper — simple cuts; basic sizes
3. Point system: (*a*) spaces in case; spacing material
4. Composition: (*a*) cost by ems in areas; (*b*) cost by hourly rate; (*c*) hand; (*d*) Linotype; (*e*) Monotype
5. Copy fitting
6. Presswork make-ready (cost)
7. Presswork running (cost)
8. Two-color work (estimating)
9. Ink (estimating)
10. Cutting (intricate cutting)
11. Bindery — cutting, punching, cost
12. Estimating parts: (*a*) ems in area; (*b*) weight of metal; (*c*) paper costs; (*d*) binding costs
13. Complete estimates — work sheets from shop — estimating jobs done in shop
14. Proportion
15. Reading micrometer

Bibliography:
Math for Printers, Auble
Practical Math, Hobbs, McKenney, Dalzell

Science

Use of tools in shop: (*a*) stick; (*b*) line gauge; (*c*) lead cutter; (*d*) mitering machine; (*e*) saw — electric
All forms of composition
Make-up: (*a*) allowance for squeeze; (*b*) furniture — material
Cutting: (*a*) spoilage; (*b*) allowance
Color mixing and appreciation
Lockup and imposition: (*a*) simple; (*b*) page; (*c*) imposition for folding machine
Presswork processes: (*a*) general care; (*b*) dressing; (*c*) packing; (*d*) setting; (*e*) make-ready
Paper analysis: (*a*) manufacture; (*b*) kinds; (*c*) how sold — weight, run, etc.
Binding: (*a*) punching; (*b*) stapling; (*c*) plastic
Machine composition: (*a*) linotype; (*b*) monotype; (*c*) metal
Miscellaneous: (*a*) photoengraving; (*b*) stereotyping; (*c*) electrotyping; (*d*) engraving; (*e*) offset printing
I.T.U. Lessons, Unit VII, Imposition
I.T.U. Lessons, Units I & II, Part of IV
General history is part of this course: (*a*) early records; (*b*) Gutenberg to early European printer; (*c*) European to present; (*d*) machine composition; (*e*) keeping in touch with modern trends
Blue workbook — on imposition
Yellow workbook — on composition
Press workbook — on composition
Bibliography:
I.T.U. Units I, II, & IV
Practice of Printing, Polk — Textbook
General Printing, Glecton, Pitkin — Textbook
Elementary Presswork, Polk
Hand Composition, John
Printing in the School, Hague
Printing, Henry

Layout and Design

1. Drawings of type faces, tools used, and types of work
2. Purpose of display
3. Ha:mony

4. Contrast
5. Balance
6. Parallel design
7. Rhythm
8. Tone
9. Use of borders
10. Use of initials
11 Sketching layouts
12. Color harmony: (*a*) color mixing; (*b*) color appreciation
13. Layouts of lockups: (*a*) single form; (*b*) 2-page; (*c*) 4-page S.W.; (*d*) 4-page W & T; (*e*) 8-page S.W.; (*f*) 8-page W & T; (*g*) 16-page S.W.; (*h*) 16-page W & T; (*i*) 32-page S.W.; (*j*) 32-page W & T; (*k*) 12-page
14. I.T.U. Lessons — Units III & IV

Bibliography:
I.T.U. Units III, IV, & VII
Book of American Type
Design for Printers, Brinkley

Printing Shop — Progress Record

Hand composition:
plain composition
display composition
tabular and rule composition
make-up
imposition
proofreading
Machine composition:
slug machine composition
monotype composition
keyboard
caster —
display
lead and rule
job
smelting
Offset photography:
camera work
developing
stripping, ruling
platemaking
Presswork:
platen — handfed
platen — automatic
vertical
cylinder — handfed
offset
Bindery:
paper cutting
stretching
folding —
hand
machine
lathering
plastic binding
punching
book trimming
padding

Sheet Metal

Almost every industry today has some use for sheet-metal workers. Graduates of this department, because they learn about so many aspects of the trade, are capable of going into almost any field.

In the shop much time is spent on seams, containers, and soldering in the beginning. Those who have mastered the essentials advance to rivets, duct work, flashings, tees, fireproofing, fender work, ventilators, collectors, arc and gas welding, and innumerable other phases of the sheet-metal trade.

In the classroom, the same course is covered with specific reference to math, drawing, and science. The science course deals with forced air heating systems, heating and ventilating systems, and power and exhaust systems.

It is fairly easy with a diploma in sheet metal to find employment in any of the several branches of the trade, such as construction and roofing, auto body repair, ventilation, plumbing and heating, aviation, or general sheet metal work.

Unit Trade — Units of Instruction

1. Utensils and containers
2. Air conditioning
3. Heating and ventilating
4. Blower and exhaust
5. Metal furniture

General Vocational — Unit of Instructions

1. Seams
2. Containers
3. Hammering and dishing
4. Bar forming
5. General metalwork

Forced Air Heating Unit No. 2

The following covers the science, math, designing, and pattern development of this unit.

The reference material used is by the National Warm Air Heating and Air Conditioning Association.

Science

What is air conditioning?; definition of terms; heat; temperature; B.T.U.'s

Calculating Heat Losses: Manual No. 3, 5th edition: calculating heat loss; windows; doors; walls; ceilings; floors; partitions

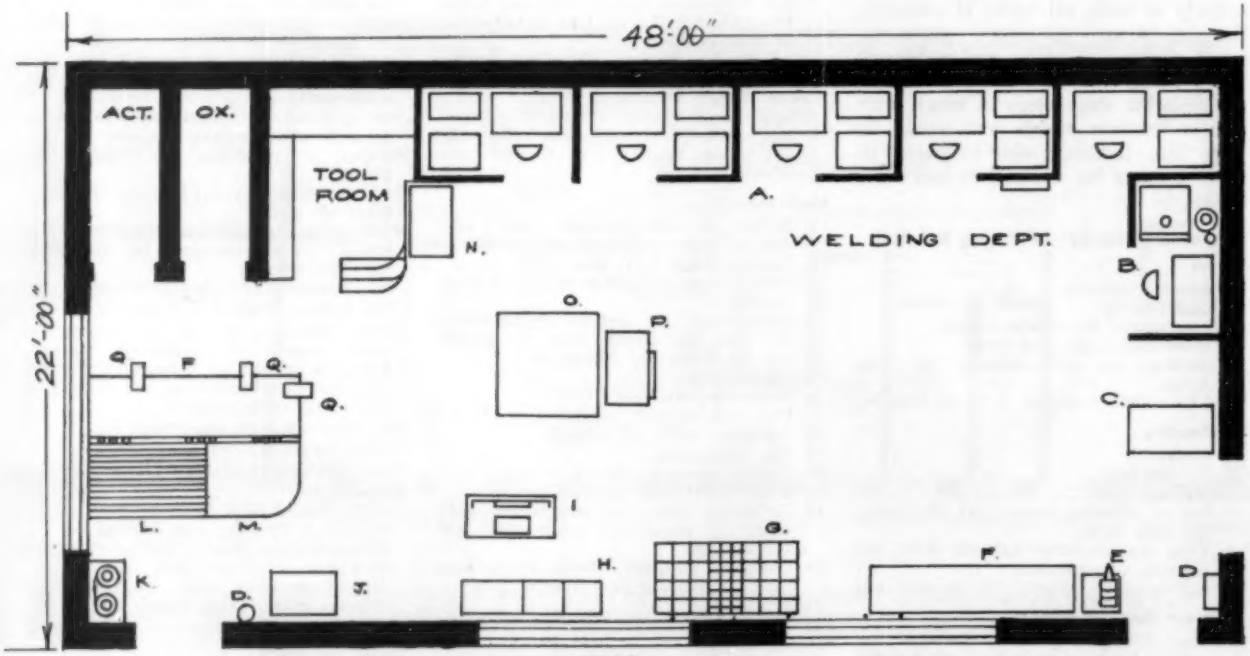
Infiltration: windows; doors

Code and Manual Design and Installation: Manual No. 7, 4th edition: selecting fittings; equivalent lengths; actual lengths; reading table No. 10 — selection chart; combination letter; W. A. systems specifications; R. A. systems specifications; extended plenum systems; method of duct design; sizing extended plenum

Sketching: plenum chambers; plenum chamber take-off; rectangular elbows; rectangular offsets; reverse boots; duct branch take-off; stackheads

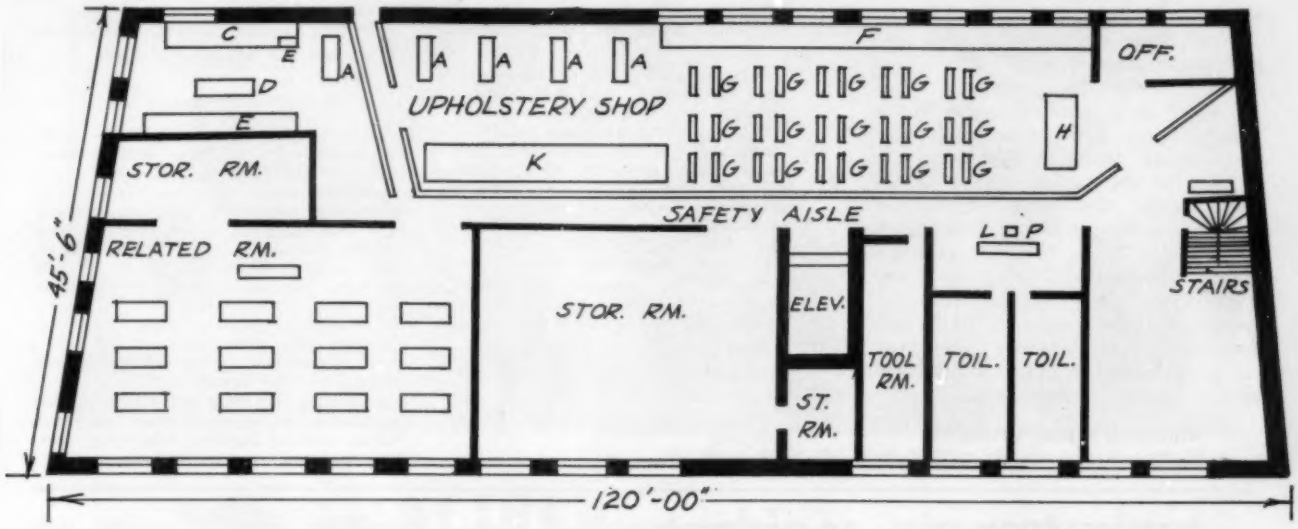
Extended plenum take-off fittings: side take-off — rect.–rd. fitting; side take-off — rect.–rect. fitting; top take-off — rect.–rd. fitting; top take-off — rect.–rect. fitting

Development: straight ducts round and rectangle; type seams; type joints; round elbows 45 deg.–90 deg.; rectangular elbows



Welding

Key to diagram: A. arc-welding booths, 5; B. Heliarc welding booth, 1; C. power band saw, 1; D. 002, 2; E. anvil, 1; F. steel bench 9 by 2 ft., 2; G. gas welding table, 1; H. file cabinet, 1; I. instructor's desk, 1; J. tensile test bench, 1; K. portable gas welder, 1; L. flame-cutting table, 1; M. water tub, 1; N. steel bench, 1; O. steel layout table, 1; P. drawing table, 1; Q. vises, 3



Upholstery

Key to diagram: A. sewing machines, 5; B. vise, 1; C. workbench, 1; D. hair picker, 1; E. storage bin, 1; F. toolbench, 1; G. upholstery horses, 30; H. glue bench, 1; clamp rack, 1; K. cutting bench, 1; L. wash-up sink, 1; M. instructor's desk and chair, 1; N. student desk, 12; O. students' chairs, 24; P. water bubbler, 1

45 deg.–90 deg. shark and radius throats; plenum chambers; rectangular offsets; stackheads

Branch take-offs — extended plenum: rect.–rd. fitting — side take-off; rect.–rect. fitting — side take-off; rect.–rd. fitting — top take-off; rect.–rect. fitting — top take-off

Boot fittings, rect.–rect., reverse rect., round rect.; plenum take-offs

Upholstery

This is the shop that turns out solid comfort in many different forms. One of the more recent unit trades, it has made itself known in this and many other cities because of the accomplished graduates it has turned out.

The new student learns first the basic principles of upholstery, namely, measuring, laying out, tearing down, webbing, batting, tacking, and sewing before moving on to more advanced work. The more advanced work is reupholstering overstuffed chairs, Cogswell chairs, saddle seats, Cape Cod chairs, platform rockers, sofas, davenports, and every other form of seating that requires work when wear appears.

The dual program includes classwork in math, drawing, and science as it pertains to upholstery. Careful figuring of material and accurate math are prerequisites for a good upholsterer. This department has a wonderful record that is growing by leaps and bounds.

Upholstery Department Shop Topics

Unit 1. Caning: common chair caning; porch chair caning; pressed seats

Unit 2. Fabric Layout: measure arms, back, seat, outside arms, outside back, panels; make working drawing for fabric layout

Unit 3. Tearing Down: remove old covers, filling, springs, burlap, webbing; repair frame; replace dowels; remove old glue; glue joints, dowels; square frame; clamp frame

Unit 4. Springing: webb frame; place springs; sew springs to webbing; tie springs; apply burlap; sew burlap to springs; stitch edge

Unit 5. Cut and Stitch Fabric: cut fabric from fabric layout; make weld; stitch insides, cushion

Unit 6. Final Covers Inside: apply filling to seat, arms, back; apply muslin; apply final cover to seat, arms, back; fill cushion

Unit 7. Final Cover Outside: apply outside arms, back; apply brass nails; glue gimp; apply fringe; cover arm panels, back panels; apply panels

Unit 8. Refinishing Woodwork: remove old finish; repair woodwork; sandpaper woodwork; apply stain, shellac; rub down finish; polish woodwork

Type Furniture: slip seat; stool; pad seat; tubular chair; saddle seat chair; boudoir chair; balloon chair; Cogswell chair; Lawson chair; club chair; wing chair; piped back chair; button back chair; double stuffed chair; lounge chair; auto seat covers; Lawson sofa

Welding

Although the welding shop is the smallest shop in the school, it is certainly not the least important. Basic to many branches of industry, the welding trade is an integral part of a trade school.

Young men who go forth with a welding diploma have had training in metallic arc fusion welding, carbon arc welding, oxygen-acetylene flame cutting, oxygen-acetylene welding, heat treatment, resistance welding, and the use of hand and power tools incident to the trade.

In the three year course in math, drawing and science are units on metallurgy, chemistry, and physics. A general knowledge of electricity (circuits, motors, generators, and transformers) is a necessity in this shop.

There is more to welding than meets the eye and a boy must be on his toes to learn in three years all there is to know to get a good start in the welding industry.

Painting and Decorating

Both in construction and maintenance, in industry and in the home, there is steady and profitable work for the trained painter.

Among the subjects covered are puttying, mixing paint, water colors, wood stains, wood finishing, paint and varnish removing, graining and marble imitation, card writing and sign painting, color combinations, spray gun, and textures.

The painting shop has made itself known to all. Much of the school has been repainted through its efforts. Many school department projects have benefited from its work.

Radio, Electronics and TV

The demand for servicemen in the radio and television field is becoming more urgent every day.

The course of study in the shop includes work on a.c. and d.c. essentials, power supplies, vacuum tubes, TV amplifiers, AM and FM receivers and transmitters, sound systems, record players, measuring instruments, television receivers, and auto and aircraft radios.

The radio, electronic and television theory, consisting of math, drawing, and science requires a keen mind and a willingness to dig in. The purpose of the course is to train students in the servicing of radio and television equipment, a field that has broadened con-

siderably in the past decade.

Ninth grade subjects other than shop are: trade science, shop math, civics, English, mechanical drawing.

English is a required course in the 9th, 10th, and 11th grades. Senior students study American History.

Some of the subject matter of GV (9th Grade) English for living and working: spelling rules; spelling; trade terminology; letter writing; punctuation; capitalization; public speaking; composition; oral English; usage — grammar; library science; vocabulary building; use of dictionary; good manners; outlining; reading for entertainment; reading for knowledge.

English II Topics, Grade 10

I. Reading

Poe's Short Stories; Greatest American Short Stories; The Four Million

II. Grammar

Rules for good usage: sentence structure; agreement of verb with subject; principal parts of irregular verbs; rules for capitals and periods; plurals of nouns; uses of the apostrophe; pronouns — case; pronouns — antecedents; adjectives and adverbs; demonstrative adjectives; phrases and clauses; misplaced modifiers; participles, gerunds, and infinitives; complex sentence; homonyms; words often confused

Punctuation: comma; colon and semicolon; quotation marks; exclamation mark, period, question mark; dash

III. Spelling

V. Book reports

IV. Compositions

VI. Vocabulary work

VII. Letter writing

Business letter: application; order; complaint

Friendly letter

VIII. Oral work

Book reports; technical explanations

IX. Prefixes and suffixes

X. Forms

Job application; income tax

The eleventh grade English topics are: spelling; punctuation; business letter writing; company suggestion writing; checks and checking accounts; insurance; bank loans; advertising the small business; expenses of a small business; social security; book reports; magazine article reports; world affairs; court procedures; bills, statements, invoices; receipts; written technical explanations; oral technical explanations; use of reference materials; income tax filing; purchase order forms; applying for a job; panel discussions; forum discussions; abbreviations; interviewing

These items are not listed in the order taught: personal initiative; good study and work habits; working together; originality; neatness; leadership and followership.

INTERPRETATION OF INDUSTRIAL ARTS IN THE SCHOOL COMMUNITY

HILARY BLANTON FORD
Industrial Arts Instructor
Calhoun Senior High School
Port Lavaca, Tex.

This is a study of school interpretation and current practices used to interpret industrial arts as a phase of the curriculum to the school-community in 125 schools in Texas.

The study was limited to an analysis of principles of school interpretation set forth in current literature and to how current industrial-arts programs were interpreted to the school and community in 125 accredited elementary, junior high, and senior high schools distributed over the state of Texas. Two hundred fifty questionnaires were mailed to industrial-arts instructors; 125 were returned and usable. This study is limited to the information and data provided by these questionnaires. Only industrial-arts instructors employed in accredited elementary, junior high, and senior high schools of Texas during the 1953–54 school year were contacted. The study was further limited in that only the principles of school interpretation, as set forth in current literature, were reviewed and used in developing the study.

Some of the data for the study were obtained from books written by persons working and writing in the field of public relations and school interpretation, and from reports compiled by research staffs of various committees and organizations interested primarily in public relations. Other data and information were obtained from bulletins and pamphlets issued by the National Educational Association, and from articles appearing in various educational magazines and journals. Additional information and data were secured through the use of a questionnaire which was designed and used in conducting the study.

Findings

When analyzed, the returns revealed the following findings:

1. Of the 125 industrial-arts instructors contacted, 29 (23 per cent) sponsored industrial-arts clubs; 19 (65 per cent) of these clubs had space in the school paper; and 12 (41 per cent) used the local newspaper.

2. Open house for the public was held in 109 (87 per cent) industrial-arts shops.

3. Seventy-seven (62 per cent) industrial-arts instructors indicated they had radio and television stations in the community in which they taught; 14 (25 per cent) of these instructors sponsored programs designed to interpret industrial arts through these media.

4. Home visitations were made by 56 (45 per cent) industrial-arts instructors.

5. Various types of invitations were extended to the general public by 113 (90 per cent) industrial-arts instructors to visit the shop.

6. Resource personnel from the community and industry were used in industrial arts classes by 19 (15 per cent) instructors.

7. Field trips were included as a part of the industrial-arts program by 12 (10 per cent) instructors.

8. Ninety-two (74 per cent) instructors encouraged students to purchase supplies from local concerns, and 112 (90 per cent) instructors purchased supplies from local dealers whenever practicable.

9. Periodic visits to local concerns were made by 103 (82 per cent) instructors.

10. Fifty-four (43 per cent) industrial-arts instructors reported their classes participated in various types of charity drives within the community.

11. One hundred eight (86 per cent) industrial-arts instructors reported they attended church within the community, and 31 (25 per cent) taught Sunday school classes.

12. Speeches to civic organizations were given by 38 (30 per cent) industrial-arts instructors and 30 (24 per cent) were members of some civic organization.

13. Thirty-six (29 per cent) instructors were Boy Scout sponsors.

14. Twenty-five (20 per cent) of the 125 industrial-arts instructors reported they participated in some type of recreational program.

15. One hundred fifteen (92 per cent) industrial-arts instructors exhibited students' projects.

16. One hundred twelve (90 per cent) industrial-arts instructors participated in or contributed to programs sponsored by the school.

17. The sharing of professional and technical information with other people was reported by 123 (98 per cent) industrial-arts instructors.

18. One hundred twenty-one (97 per cent) of the 125 industrial-arts instructors stated they developed friendly relations with the administrative staff and welcomed suggestions.

19. Eighty-three (66 per cent) instructors gave demonstrations to other teachers pertaining to industrial arts.

20. Thirty-seven (30 per cent) industrial-arts instructors took pictures of work well done in the industrial-arts shop; eight (6 per cent) took movies and showed them to interested groups, and 12 (10 per cent) took movies or pictures of outstanding school events.

21. The organizing of home workshop clubs was reported in connection with the regular class room activities by 57

(Continued on page 26A)

The shop of Hackley High School, Muskegon, Michigan, is equipped with Olivers

OLIVER machines give students most thorough basic training

Used in over 2360 leading vocational shops

The outstanding efficiency of Oliver equipment in dollars and cents is being proved every day on factory floors. The Oliver-trained student learns more on the machines used by industry.

Why are Oliver machines preferred? They are built to endure rugged service year after year. They make the efforts of instructors easier and more effective. Furthermore, Oliver machines are the safest to use.

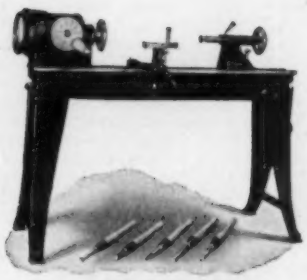
Students soon find Oliver machines can be set up quickly and accurately. Self-locking devices keep the machines in perfect adjustment.

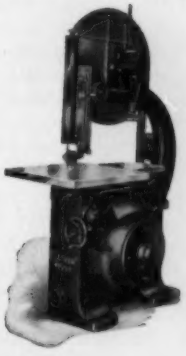
In over 2360 vocational shops instructors agree that Oliver equipment gives more and better service. The machine shown here are but a few of a complete line to make your teaching most effective.

OLIVER EQUIPMENT FOR VOCATIONAL SHOPS

Band Saws	Tenoner
Band Saw Brazer	Jointer-Planers
Mortisers	Jig Saw
Shapers	Wood Trimmers
Borers	Surfacers
Saw Benches	Oilstone Tool Grinders
Cut-off Saws	Knives and Saws
Woodturning Lathes	Benches and Vises
Metal Spinning Lathes	Disk and Belt Sanders

Let us send you bulletins containing full details on the machines that interest you.





OLIVER
SINCE 1890

OLIVER MACHINERY COMPANY
Grand Rapids 4, Michigan

INTERPRETING INDUSTRIAL-ARTS

(Continued from page 112)

(46 per cent) industrial-arts instructors. Thirty-nine (31 per cent) instructors reported they promoted contests in industrial-arts shops.

22. Sixty-seven (54 per cent) instructors encouraged father-and-son planning of industrial-arts projects.

23. Adult classes were taught by 24 (19 per cent) industrial-arts instructors.

24. Seventy-six (61 per cent) instructors reported the maintenance personnel used industrial-arts shops, and 39 (31 per cent) instructors stated they helped the maintenance personnel with problems.

25. Invitations to other teachers to visit classes and observe class operation were extended by 104 (83 per cent) industrial-arts instructors.

Conclusions

The results of this study concerning the current practices of industrial-arts interpretation programs in 125 schools in Texas indicate these schools have some type of interpretation program in use. A large number of the industrial-arts instructors concerned in this study do use some of the various phases of the interpretation program recommended by authorities in the field of education and industrial arts. Some programs were, with respect to content and practices, more extensive than others.

The study further revealed that not a single industrial-arts interpretation program involved all the principles set forth by authorities in the field of public relations. The majority of the industrial-arts interpretation programs utilize less than 60 per cent of the recommended principles as set forth for public relations.

Recommendations

The following recommendations are based upon an analysis of the data collected and analyzed in this study. These recommendations are as follows:

1. A study should be made by industrial-arts instructors in their schools to determine the effectiveness of the industrial-arts interpretation program in a school-community situation.

2. Industrial-arts instructors should utilize results of research in an effort to determine the extent to which the public relations program should be included.

3. An effort on the part of the industrial-arts instructor should be made to provide adequate and continuous participation in each and every phase of the industrial-arts interpretation program.

4. Field trips, resource personnel, exhibits, and articles in newspapers should be used more extensively by all industrial-arts instructors as mediums in the interpretation program.

Submitted by Louis J. Enos, Lincoln Junior High School, Sacramento, Calif.

5. Every college offering industrial-arts education should stress the importance of public relations in its program.

Rope is the lifeline of luxury liner, cargo ship, tug, and fishing schooner. It is used in some 250 ways — for towing, cargo handling, lashing, life lines, nets. While most ropes are made of manila fiber, oil-based nylon is fast growing in popularity, particularly with towing companies. Nylon rope is unusually light, strong, and elastic. Today, every tug is equipped with at least one nylon rope of 1200 feet for deep sea work. So petroleum has gone down to the sea in ships, as a seaworthy mate of the maritime industry. — *Petroleum Newsnotes.*

Automotive Equipment, Tools, and Supplies

This list of automotive equipment tools and supplies was prepared by the Automotive Industry — Vocational Education Conference on public school automotive instruction. It is reproduced here by permission for which A. D. Althouse, Detroit Board of Education and co-chairman of the conference, deserves special credit.

Because yearly changes in car and truck design often necessitate new service procedures, and consequently new types of tools, shop equipment must be replaced when it becomes obsolete as well as when it wears out.

The Automotive Industry — Vocational Education Conference therefore suggests the following amortization policy: hand tools, 2 years; special tools and testing devices, 5 years; and automotive parts, 3 years.

Supplies and Equipment

AIR HOSE
- 25′ length, ¼″ I.D., 5 ply red, complete with ¼″ pipe fittings

BATTERY BOLTS
- 5/16″ x 1½″ U.S.S. lead coated battery terminal bolts complete with nuts

BATTERY CLIPS
1. "B" battery clips cadmium plated
2. 50 ampere battery charging and test clips, lead coated

BATTERY COMPOUND — battery sealing compound

BINDING POSTS — screw type

BLADES
1. Hand hack saw, 24 teeth per inch
2. 10″, 32 teeth per inch hand hack saw

BRUSHES
1. 1½″ flat
2. 14″ x 1⅛″ steel wire, curved handle
3. 6″ diam. steel, wheel
4. 8″ bench or counter

BULBS
1. Auto lamp bulbs, 6 and 12 volt
2. Lamp auto, sealed beam No. 50–40 watts, double filament, three contact, 6 and 12 volt
3. Battery charger bulb (specify ampere capacity)

CABLE
1. Extension cable, double conductor, molded rubber covered, 18 ga. heavy duty
2. Primary, single conductor, stranded copper braid and lacquer covered, 14 gauge
3. Secondary, 7 millimeter, rubber, braid lacquered brown
4. Starter cable, No. 1 gauge rubber and woven cover insulation.
5. Starter cable, No. 6 gauge rubber and woven cover insulation

CABLE TERMINALS
1. Battery cable ground lugs for No. 1 starter cable
2. Battery cable ground lugs for No. 6 starter cable
3. Battery cable terminals, universal type or equal
4. Clip type, high tension terminal for 7mm. cable
5. Terminals, as-sos-11 solderless
6. Terminals, 3/16″ hole primary
7. Terminals, 3/16″ spade type primary

CHECKS, TOOL — brass, 1″ round

CLEANING COMPOUND
- Oakite, Stoddart solvent or other material depending on the type of cleaning tank used.

CLIPS — crocodile

COTTER PINS
1. 1/16″ x ¾″, box of 1000
2. 3/32″ x 1″, box of 1000
3. ⅛″ x 1½″, box of 1000

DRILLS
1. H.S.S., ⅛″, jobbers, straight shank
2. H.S.S., 5/16″, jobbers, straight shank
3. H.S.S., 13/64″, jobbers, straight shank
4. H.S.S., 7/32″, jobbers, straight shank
5. H.S.S., ¼″, jobbers, straight shaenk
6. H.S.S., 17/64″, jobbers, straight shank
7. H.S.S., 5/16″, jobbers, straight shank
8. H.S.S., 21/64″, jobbers, straight shank
9. H.S.S., 23/64″, jobbers, straight shank
10. H.S.S., ⅜″, jobbers, straight shank
11. H.S.S., 25/64″, jobbers, straight shank
12. H.S.S., 27/64″, jobbers, straight shank
13. H.S.S., 7/16″, jobbers, straight shank
14. H.S.S., 29/64″, jobbers, straight shank
15. H.S.S., ½″, jobbers, straight shank

DRY CELL
- No. 6 dry cells, with screw connections

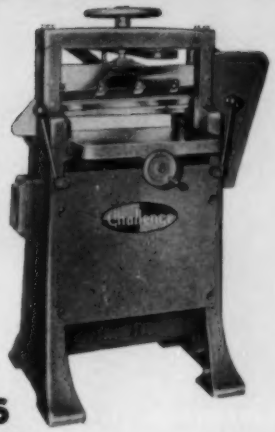
EMERY CLOTH — No. 2/0, 9″ x 11″

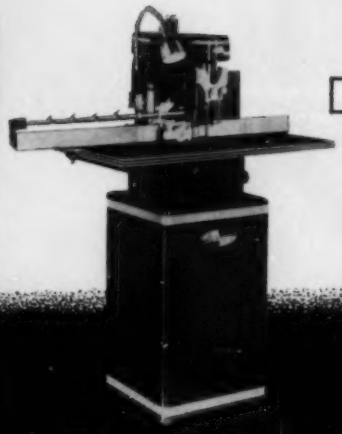
FILE
1. 10″ flat bastard (24 minimum)
2. 10″ half round bastard (6 minimum)
3. 10″ half round lead float (4 minimum)
4. 10″ hand smooth (12 minimum)
5. File handle, large, medium, small (specify size), (24 minimum)
6. 10″ mill smooth (12 minimum)

(Continued on page 36A)

☐ CHALLENGE PAPER CUTTERS

Widest range of lever and power operated paper cutters in sizes suitable for use in school shops. Rugged construction and special safety devices make these ideal for school shops. Also have wide application in handling numerous school paper cutting requirements.



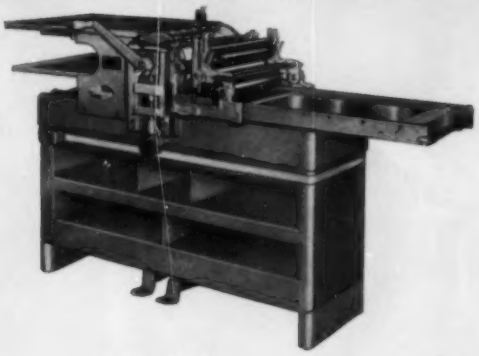


☐ CHALLENGE PAPER DRILLS

Available in a variety of power driven models ranging from simplest hand operated bench type units to the more automatic hydraulic units. Can handle a wide variety of paper drilling requirements — also do round cornering, slitting and slotting.

Challenge SAFETY ENGINEERED printing equipment

A Complete Range of Hand-Operated and Modern Power-Operated Equipment for All Types of School Shops

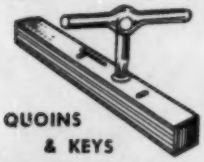


☐ CHALLENGE PROOF PRESSES

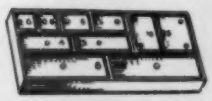
13 models including the Style E widely used for school use. More advanced models used for reproduction proofing for engravings, offset platemaking or direct image making of duplicator or small offset plates. Widen scope of school shop.

☐ CHALLENGE SHOP SUPPLIES

A complete selection of labor-saving devices used in print shops of all sizes. including .....



QUOINS & KEYS



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STEEL STORAGE GALLEY

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The CHALLENGE MACHINERY CO.

Offices, Factories and Showroom:

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Dealers in All Principal Cities

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☐ Challenge Paper Cutters ☐ Challenge Paper Drills
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Name_____

School_____

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DELTA
ROCKWELL

For Metalworking

DRILL PRESSES: 20", 17", 15", 14" Utility, 14" Super-Hi Sensitive

TOOL GRINDERS: 7" Standard Grinder, 6" Carbide Grinder

CUT-OFF MACHINES: Wet Abrasive, Dry Abrasive, Non-Ferrous Metal, Wood

GRINDERS: Toolmaker Grinder, Standard Surface Grinder, Chip-Breaker Grinder, Tool & Cutter Grinder

11" METAL CUTTING LATHES: Five-foot Bed, Four-foot Bed

BELT GRINDERS: 2½"

BAND SAWS: 14", 8-Speed Metal-Wood

DELTA . . . PRIDE OF THE NATION'S SCHOOLS

DELTA
ROCKWELL

For Woodworking

SHAPER: Industrial and Bench

CIRCULAR SAWS: 12", 10" Tilting Arbor; 10" T.A. Bench

BAND SAWS: 20", 14"

RADIAL SAWS: 20", 14", 10", 9"

JOINTERS: 8", 6" Long Bed

SCROLL SAW: 24"

PLANER: 13" x 5"

ROCKWELL-BUILT

DELTA power tools

World's most complete, most versatile, most useful line of metalworking and woodworking power tools

53 Machines...246 Models...Over 1300 Accessories

SAFE
SIMPLE
ACCURATE
PRACTICAL

Safety is built right into Delta tools—assures maximum protection for student, prevents damage to tool. One important reason why over 70% of U.S. school shops are Delta equipped.

Simplicity of design makes Delta tools remarkably easy to operate. Students learn quickly, need minimum instruction. Helps you take care of increased enrollments because you teach more students in less time.

Delta quality tools are accurate—and built to *stay* accurate! Delta's years of unmatched experience, plus the finest manufacturing facilities and highest quality materials, assure years of dependable operation, low maintenance.

Teach with the tools so widely used throughout industry. More and more of your students will use Delta tools on their jobs after graduation—another important reason for training them on Delta tools *now*.

Delta's leadership is based not only on fine quality tools, but on the highest type cooperation and service. Helpful Delta "How To" books, films and publications provide information and ideas for practical, effective industrial arts instruction. And your nearby Delta Dealer provides prompt, efficient service when you need it. He's listed under "TOOLS" in the yellow pages of your phone book.

Send for all the facts—NOW!

Delta Power Tool Division, Rockwell Manufacturing Co.
402C N. Lexington Avenue, Pittsburgh 8, Pa.

- ☐ Send fact book on using Delta Power Tools teamed with Machine tools.
- ☐ Send complete Delta Industrial Catalog.
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Name_____ Title_____

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City_____ County_____ State_____

DELTA ROCKWELL

another product by

ROCKWELL

Woodworking Equipment, Tools, and Supplies

These lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films, and silent, or sound movies, may be used by the students in the industrial arts and vocational education courses.

BENCH
1. Shop, with hardwood tops, 1¾ in. or over in thickness, the top to project far enough to allow a rapid-acting or continuous-screw vise to be attached.
   It may be well to order a 1-in. birch or maple board wide enough to cover the working face of the bench at the time of buying the benches. This board can then be fastened to the top proper with screws and may be conveniently replaced when worn. The benches should be made of thoroughly kiln-dried lumber throughout. They may be either plain or of 6-drawer type
2. Glue 3. Stain, with metal-covered top
4. Teacher's demonstration

BOOKCASE

BULLETIN BOARD

CABINETS — wood or metal for filing class records, instruction sheets, drawings, finishing materials, hardware, small tools, supplies, etc.

CHAIRS — teacher's and tablet arm

CHALKBOARD — permanent or portable

CORE OVEN — for patternmaking class

DESK — teacher's, with drawer compartments

DRILL — portable electric

FURNACE — for melting soft metals (for patternmaking class)

GLUEPOT — 1 qt. or 2 qt., electric, gas, or steam heat

GLUE WARMER OR COOKER — 1- to 5-gal. capacity

GRINDER
1. Automatic knife, direct-motortype. Size to suit largest knife used in school shop, complete with water pump, grinding wheel, and automatic stops
2. Bench, hand or power
3. Bench, motor-in-head. Motor bearings to be completely housed, wheels to be equipped with safety flanges and carefully guarded throughout. One fine-grit, and one coarse-grit wheel
4. Revolving oilstone, pedestal type, with one fine and one coarse oilstone

JOINTER
1. 6- or 8-in. portable jointer. Table to be fitted for rabbeting. Safety-cylinder type, equipped with safety guard
2. 12-, 16-, or 18-in. direct motor drive, ball bearing. Cylinder to be of safety-head type. Table to be fitted for rabbeting. Jointer to be equipped with safety guard.

LATHES
1. 6- to 16-in. motor-in-head, motor-in-base, or belt-driven speed lathe, to take 24, 36, 48, 60, or 72 in. between centers. Each to be complete with cup center, spur center, faceplate, rosette chuck, tool rests, and center drift for head block.
2. Patternmakers', with end faceplate provision. Lathe to be of direct-motor-drive type, equipped with variable speed motor, faceplates and floor stand. (For patternmaking class)

MORTISER
1. Direct-motor-drive, or belt-driven, hollow-chisel mortiser, foot feed. Table to be of the tilting type with hold-down clamps and stop rod.
2. Portable, vertical, hollow-chisel mortiser, bench type

PLANER — 12-, 18-, 20-, 24-, or 30-in.., motor or belt driven, single-surface planer. Safety-head cylinder, three-knife type, fitted with good-grade steel knives. Knife-setting and jointing device complete with bar should be mounted on machine if possible.

SANDER
1. Belt, direct motor drive
2. Disk, motor or belt driven
3. Oscillating spindle, motor driven
4. Portable, hand-plane type, direct motor drive
5. Vertical spindle and disks sander

SAWS
1. Band saw, 20 to 36 in., motor drive. Upper and lower wheels to be completely guarded. Table to tilt to 45 deg.
2. Combination, band saw, crosscut saw, ripsaw, and mortiser. Machine to be completely guarded
3. Cutoff, pedestal or swing type to be fitted with 12- to 16-in. saw
4. Filing machine, direct motor drive
5. Jig, direct motor or belt driven
6. Portable band saw, 14 to 20 in. ball bearing, motor driven
7. Saw bench, directly connected to motor, and to have both rip and crosscut saws. Rip and crosscut gauges also to be provided
8. Universal saw bench, 14 to 16 in., motor driven
9. Variety saw bench, motor driven, tilting table, with universal sliding table. The arbor is to be fitted for a dado head, and the table is to be slotted accordingly. The saw is to be equipped with ripping fence and miter cutoff gauges

SHAPER
1. Motor drive, single or double spindle. Table to be equipped with removable center plate.
2. Portable shaper or router with a suitable selection of cutters

TENNONER — single end, with coping heads and cutoff saw

VISES — rapid-acting or solid-nut type woodworking-bench vises, 7 to 10 in.

WOOD TRIMMERS — complete with all gauges and taper pins. Base of trimmer to be slotted and laid out for degree settings (for patternmaking class).

Woodworking — Small Tools

AWLS — brad, assorted sizes

BEVELS
1. Protractor
2. Sliding T, 8 in.

BITS
1. Auger, 3/16 to 1 in., inclusive, by 16ths
2. Auger, 3/16 in. to ½ in. inclusive, by 16ths
3. Braces, ratchet type, 8-, 10-, 12-, or 14-in. sweep
4. Countersink, for wood, rose pattern, ½ in. and 5/8 in.
5. Dowel, square shank, ¼ in., 5/16 in., 3/8 in., ½ in., ¾ in.
6. Expansive, 7/8 in. to 1½ in.
7. Expansive, 7/8 in. to 3 in.
8. Forstner, square shank, ¼ in. to ½ in. inclusive, by 16ths
9. Screw driver square shank, ¼ in., 5/16 in., 3/8 in.
10. Twist drill for wood, square shank, 1/16 in. to 3/8 in. inclusive, by 16ths
11. Twist drill, straight shank, 1/16 to 3/8 in. inclusive, by 32nds

BLOWTORCH

BROOMS

BRUSHES
1. Bench duster, 10 in.
2. Floor
3. Glue, round, ½ and ¾ in.
4. Glue, round, 1½ in.
5. Marking, camel's hair, No. 1 and No. 2
6. Varnish, flowing, 2 and 2½ in.
7. Varnish, flat, ½, ¾, and 1 in.

BURNISHERS — oval or round

CAN OPENER

CARVING TOOLS
1. Sets containing 6 tools
2. Sets containing 12 tools

CHISELS
1. Cold, machinists', 3/8 and ½ in.
2. Mortising chisel and bits, ¼ to 5/8 in. by 16ths
3. Socket firmer, bevel edge, 1/8, ¼, ½, ¾, 1, and 1½ in.
4. Socket firmer, plain edge, ½, ¾, and 1 in.
5. Tanged firmer, bevel edge, 1/8, ¼, ½, ¾, 1, and 1¼ in.

CLAMPS
1. Bar, 24, 36, 48, and 60 in.
2. Hand-screw, 4, 5, 6, 7, 8, 10, 12, and 14 in.

DIVIDERS — wing, 6 in. and 10 in.

DOWEL PLATE — 6 in. long

DOWELING JIGS — with bushings

DRAWKNIVES — 7 in.

DRILL
1. Automatic hand, with 8 drill points
2. Chuck, 0 to 3/8 in.
3. Hand, 0 to 3/8 in., for roundshank drills
4. Star, for concrete, ½ and ¾ in.

FILES
1. Auger bit, assorted, 6 in.
2. Cabinet, 8 and 10 in.
3. Card and brush
4. Flat, wood, 10 in.
5. Mill, bastard cut, 12 in.
6. Round, bastard cut, 12 in.
7. Taper, slim, 5½ and 7 in.

FIRST-AID CABINET AND SUPPLIES

GAUGES
1. Bit, adjustable
2. Jointer
3. Marking, metal or hardwood
4. Mortise, metal or hardwood
5. Panel

GLASS CUTTER

GOUGES
1. Tanged firmer, outside ground, handled, 1/8, ¼, ½, ¾, and 1 in.
2. Tanged firmer, inside ground, handled, 1/8, ¼, ½, ¾, and 1 in.
3. Spoon, ½, ¾, and 1 in.

HAMMERS — claw, bell faced, 10-, 12-, 13-, and 16-oz.

HATCHET — bench, 4-in. cut

JARS — earthenware, 1 qt. capacity

KNIVES
1. Jointer, to fit power machine
2. Planer, to fit power machine
3. Sloyd, 3-in. blade

LEVELS
1. Wood, 24 in.
2. Machinists', 12 in.

MALLETS — hickory, 3 by 5 in. head

NAIL SETS — 1/16 and 3/32 in. points

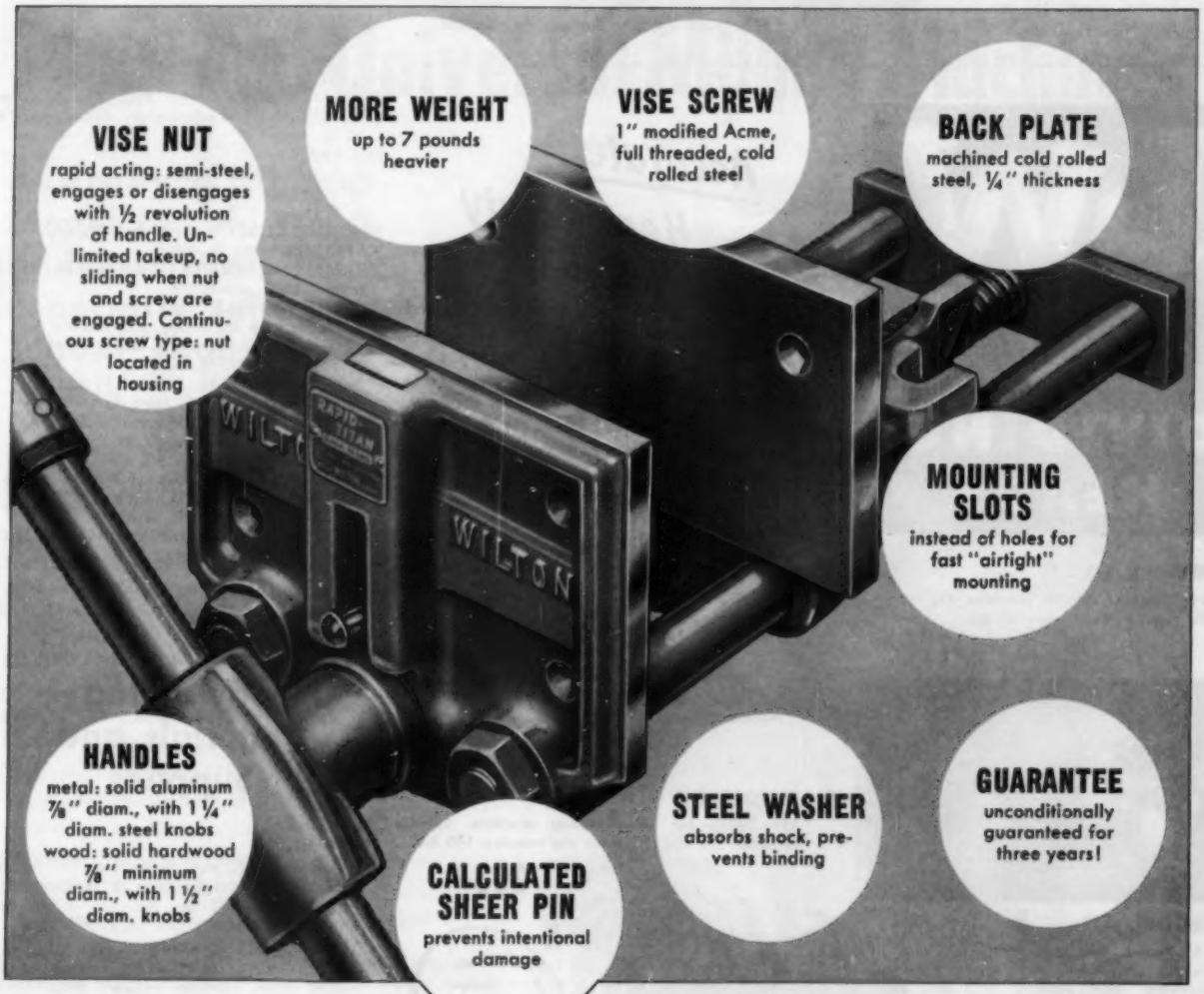
OILERS — bench, ⅛ pt., coppered, best grade

OILSTONES
1. 1 by 2 by 8 in. in iron box

(Continued on page 32A)

the logical buy in woodworkers' vises is WILTON!

now! WILTON explodes the myth that quality is expensive!


VISE NUT
rapid acting: semi-steel, engages or disengages with ½ revolution of handle. Unlimited takeup, no sliding when nut and screw are engaged. Continuous screw type: nut located in housing
MORE WEIGHT
up to 7 pounds heavier
VISE SCREW
1" modified Acme, full threaded, cold rolled steel
BACK PLATE
machined cold rolled steel, ¼" thickness
MOUNTING SLOTS
instead of holes for fast "airtight" mounting
HANDLES
metal: solid aluminum ⅞" diam., with 1 ¼" diam. steel knobs
wood: solid hardwood ⅞" minimum diam., with 1 ½" diam. knobs
CALCULATED SHEER PIN
prevents intentional damage
STEEL WASHER
absorbs shock, prevents binding
GUARANTEE
unconditionally guaranteed for three years!
WILTON

★ **WILTON is undisputed leader in vise design and manufacture!**

★ **WILTON leadership means that WILTON woodworkers' vises have the most wanted, most necessary features!**

★ **WILTON features cost no more, so the logical buy in woodworkers' vises is WILTON!**

SCHOOL EQUIPMENT SALES DIVISION OF

WILTON

TOOL MFG. CO., INC.
SCHILLER PARK, ILLINOIS
Manufacturers of the world's finest and most complete line of clamping tools!

(Continued from page 30A)

2. Gouge slip, medium, 4½ by 2⅛ by ⅝ by 3/16 in.
3. Gouge slip, fine, 3 by 2 by ⅜ by ⅛ in.

PINCERS — 6 in. carpenters'

PINCH DOGS — ¾, 1, and 1¼ in.

PLANES
1. Block, adjustable, 6 in. long, 1⅝-in. cutter
2. Circular
3. Combination, adjustable
4. Core box
5. Duplex, fillister and rabbet
6. Fore, ⅛ in., 2⅜-in. cutter
7. Irons, double
8. Jack, 14 in., 2-in. cutter
9. Jointer, 24 in.
10. Round, wood, 1¾ in.
11. Router
12. Smooth, 9 in., 1¾- or 2-in. cutter

PLIERS
1. Roundnose, 5 in.
2. Side-cutting, 6 in.

PUTTY KNIVES

RASPS — half round, wood, 10 in.

RULES
1. Board
2. 1 or 2 ft. graduated by 8ths and 16ths
3. Shrink, ⅛ and 3/16 in.

SAWS
1. Back, 12 in., 14 point
2. Band, to fit power machine
3. Compass, 10 in.
4. Coping, frames
5. Coping, blades
6. Crosscut, 9 tooth, 22 in. long
7. Crosscut, circular for power machine
8. Dado, ⅛ to 1 1/16 in. to fit power-saw arbor
9. Hack, frames, 10 in. or adjustable
10. Hack, blades, 10 in.
11. Keyhole, 10 in., 10 point
12. Rip, 7 point, 22 in. long
13. Rip, circular for power machine
14. Set, 10 points per inch and finer
15. Set, 10 points per inch and coarser
16. Turning frame, 14 in.
17. Turning blades, 3/16 by 12 in., 10 tooth
18. Miter box, 24 by 4 in. saw, 7 in. capacity at miter

SCRAPERS
1. Cabinet
2. Glue, triangular
3. Veneer, blade, 2¾ in. long, handle 11 in. long

SCREW DRIVERS
1. Cabinetmakers', 4, 6 and 8 in.
2. Quick return, spiral ratchet

SHOOT BOARD — and plane

SNIPS — tinners', forged steel, 2½-in. cut

SPOKESHAVES — adjustable, raised handle, 10 in. long

SQUARES
1. Combination, 12 in.
2. Try, iron handle, 8 in.
3. Framing, 2 ft.

STEEL FIGURES — hand cut, ⅛ in.

TAPELINE — 50 ft., steel

TRAMMEL POINTS — adjustable metal frame, steel points

TURNING TOOLS
1. Calipers, 6 in. inside and outside
2. Calipers, 12 in. inside and outside
3. Parting tools, ⅛ in.
4. Round point, ¼, ½, and ¾ in.
5. Spear point, ¼, ½, and ¾ in.
6. Square point, ¼, ½, and ¾ in.
7. Turning chisels, ¼, ½, and ¾ in.
8. Turning gouges, ¼, ½, and ¾ in.
9. Turning skews, L.H., ¼, ½, and ¾ in.
10. Turning skews, R.H., ¼, and ½ in.

VISE — 3-in. jaw, anvil face

WRENCHES
1. Adjustable, 8, 10, and 12 in.
2. Headless setscrew
3. Pipe, 10 and 12 in.
4. S type or open-end type to fit ⅛ in. to 1-in. N.C. nuts

Woodworking — Materials and Supplies

ALCOHOL

BENZINE

BRADS — ⅜, ½, and 5/8 in. No. 20; ¾ and ⅞ in. No. 19; 1 in. No. 18; 1¼ and 1½ in. No. 16; 1¾ in. No. 15; 2 in. and 2½ in. No. 14

CARBON PAPER — black

COLORS — dry: burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, Vandyke brown, and vermillion

COLORS — ground, in oil or japan; burnt sienna, burnt umber, cobalt blue, chrome yellow, drop black, lamp black, Prussian blue, raw umber, rose lake, Vandyke brown, and vermillion

DECALCOMANIA TRANSFERS

DOWEL PINS AND PLATES

DOWELS — hardwood, 3-ft. lengths, ¼, 5/16, ⅜, ½, and ¾ in.

ENAMEL
1. Selected colors
2. Undercoater

FILLERS — paste: natural golden oak, dark oak, and mahogany

FILLETS — leather, ¼ and ½ in.

(Continued on page 34A)

LW

America's Largest Builders of

DIVIDING HEADS

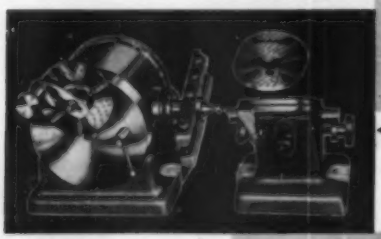
Accurate, Heavy Duty

Ball bearing thrust on worm shaft and rear end of spindle. Headstock spindle has threaded nose. Large tapered bearing adjustable for end play. Head tilts past 90°. Worm wheel and alloy stress-proof steel worm cut to close limits for accuracy. Complete with three index plates for dividing all numbers to 50 and even numbers to 100 except 96T. Index chart shows all divisions obtainable to 380. Specify left (illustrated) or right hand model.

MODEL SD

6½" Swing. Spindle threaded 1½"-8. 9/16" table slot tongues. 36 lbs.

$175.00



MODEL BP

11" Swing for plain milling machine. Spindle threaded 2¼"-10. ⅝" table slot tongues. 140 lbs.

$295.00

MODEL AU

11" Swing. Fully universal for complete indexing and spiral cutting. Spindle threaded 2¼"-10. ⅝" table slot tongues. 190 lbs.

$460.00

* See your dealer or order direct, giving dealer's name.

Send for complete catalog giving prices and specifications on these quality, low-cost L-W Products

L-W CHUCK COMPANY

69 South St. Clair Street
Toledo 4, Ohio

For Vocational Training...

Budget Priced

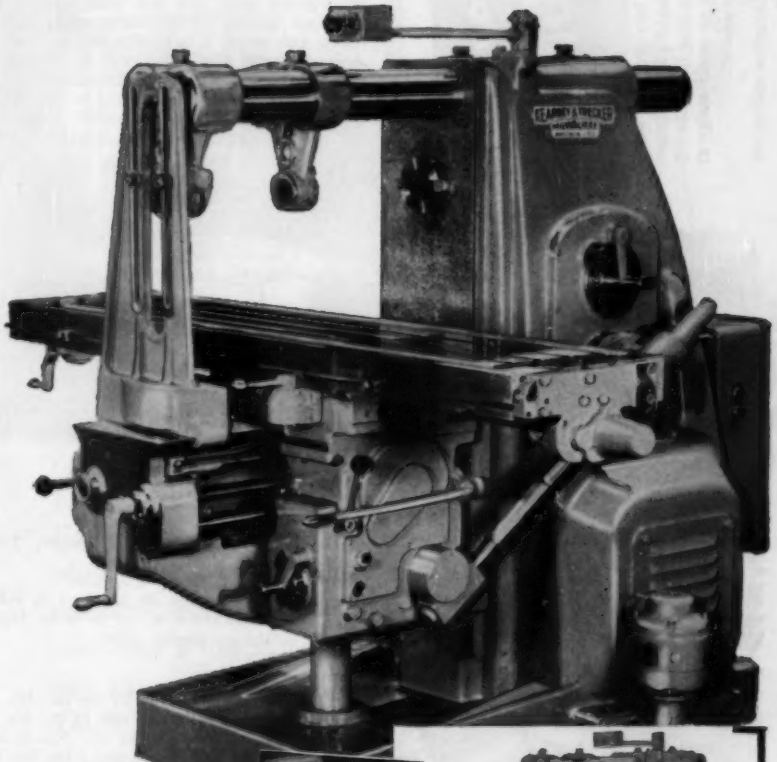
Plain and Universal Milling Machines

Kearney & Trecker Model CE 3hp No. 2 and 7½hp No. 3 . . . especially suited to school shop needs

HERE'S Kearney & Trecker's answer to Education's need for a new milling machine that combines quality with *low cost*. The new Model CE's give you the three most wanted features—*Efficiency, Ease* and *Economy* of operation.

The economical Model CE's are available in either No. 2 (3hp) or No. 3 (7½hp) size — both in plain and universal styles. The CE's feature 16 quick-change speeds (25 to 1300 rpm) and feeds (½ to 25 imp). They are ideally suited for a wide variety of application — especially useful in operator training and demonstration of milling operations.

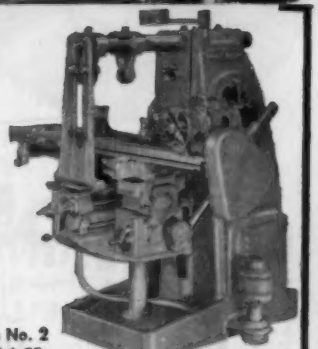
For the full story, contact your nearest Kearney & Trecker representative, or write Kearney & Trecker Corp., 6784 W. National Avenue, Milwaukee 14, Wisconsin.



7½ hp No. 3 Model CE plain milling machine
NOTE: Standard equipment includes choice of only one arbor support. Overarm brace available at additional cost.

Free Catalog! Ask for complete data on Model CE milling machines, catalog No. CE-10. Also see our catalog in Sweet's Machine Tool File.

Visual Aids
More than 250 schools and colleges use Kearney & Trecker equipment and visual training aids. Aids are available at nominal or no cost to educational institutions. Write for details.



3hp No. 2 Model CE universal milling machine
NOTE: Standard equipment includes choice of only one arbor support. Only Conventional Lead Attachment (shown above) is available in Model CE Universal machines. Overarm brace available at additional cost.

KEARNEY & TRECKER MILWAUKEE ®

(Continued from page 32A)

GLUE
1. Casein, hide, best grade cabinet
2. Liquid

HARDWARE — brackets, buttons, butts, casters, catches, chain, chest corners, chest trimmings, corner braces, corner irons, corner plates, desk fittings, door fittings, escutcheons, fasteners, handles, hangers, hinges, hasps, holders, hooks, knobs, latches, lamp fittings, lid supports, locks, pulls, smoking-stand outfits, springs, stops, supports

HOOKS
1. And eyes
2. Cup
3. Screw
4. Square screws

LACQUER — black, clear, cobalt blue, ivory, medium green, red, thinner, white, and yellow

LUMBER — ash, balsa, bass, birch, cherry, cypress, locust, mahogany, maple, oak, poplar, red cedar, red gum, redwood, sap gum, yellow pine, walnut, white pine
In ordering pine, mill run, kiln dried will be found suitable for carpentry, while short, select, kiln dried, 4 in. and wider or No. 1 shop common, kiln dried will be required for cabinetmaking and patternmaking
Hardwood for furniture should be specified first and second grade, kiln dried, standard widths and lengths, or short lengths

MOLDINGS

NAILS
1. Common, 6d, 8d, and 10d
2. Flathead, ½ in. No. 20, ¾ in. No. 19, 1 in. No. 18, 1¼ in. and 1½ in. No. 16, and 2 in. No. 14
3. Finishing, 4d, 6d, and 8d

OIL
1. Linseed, boiled
2. Linseed, raw
3. Machine
4. Rubbing

OVERLAY CARVINGS

PANEL OR PLYWOOD — 3 ply, 5 ply, and 7 ply

PATTERN LETTERS

PINS — escutcheon

PUMICE STONE — No. 0

RAPPING PLATES

ROTTENSTONE

SANDPAPER — Garnet cabinet paper, 3/0, 2/0, 0, ½, 1
Garnet finishing paper, 6/0, 4/0
Garnet paper can also be obtained in rolls of 50 yd. in widths 4 in. up to 48 in. Narrower widths on special order

SCREW EYES

SCREWS
1. Flathead, brass, No. 3 by ⅜ in., No. 4 by ½ in., No. 5 by ⅝, and ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., No. 10 by 1¼, 1½ and 2 in., No. 12 by 1¼, 1½, and 1¾ in.
2. Flathead, bright, No. 3 by ½ in., No. 4 by ½ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1, and 1¼ in., No. 10 by 1¼, 1½, and 1¾ in., No. 12 by 1½, 1¾, and 2 in., No. 14 by 2¼ and 2½ in.
3. Oval head, brass, No. 5 by ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., and No. 10 by 1¼ in.
4. Roundhead, blued, No. 3 by ⅜ and ½ in., No. 5 by ¾ in., No. 6 by ¾ in., No. 7 by ⅞ in., No. 8 by 1 in., No. 10 by 1½. and 1½ in., No. 12 by 1½ in.
5. Roundhead, brass, No. 3 by ⅜ in., No. 4 by ½, and ⅝ in., No. 5 by ¾ in.

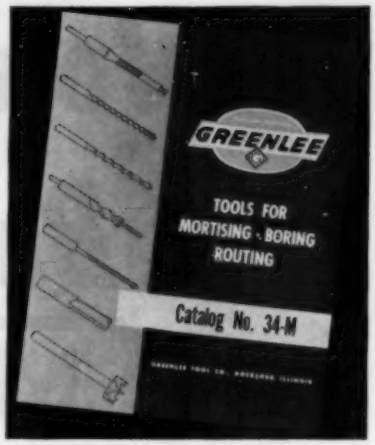
SHELLAC
1. Orange, cut 4 lb. to the gal.
2. Sticks, assorted colors
3. White, cut 4 lb. to the gal.

NOTE: Shellac should be kept in glass or earthenware containers

STAINS — oil, spirit, or water. Fumed oak.

(Continued on next page)

Lowest Prices for Top Quality!
SIMONDS SI-CLONE SAWS
You get Simonds Guaranteed Quality, the buy-word in saws for more than 100 years, at no more than you would pay for regular saws . . . see price list. And Simonds Si-Clone line includes 13 types up to 12" diameter. So get the Si-Clones you need *today* at your local hardware or woodworking machinery dealer.
GUARANTEE: Made of SIMONDS STEEL fully guaranteed against any defect in material or workmanship.
RETAIL SELLING PRICES
For Rip, Cut-Off, Easy-Cut and Combination Saws
6" . . . $2.01
7" . . . 2.30
8" . . . 2.47
9" . . . $2.65
10" . . . 3.02
12" . . . 3.62
Supplied with Round or Special Shape Holes
As Listed in Simonds Catalog "S"
5.00
SIMONDS SAW AND STEEL CO.
FITCHBURG, MASS.
Factory Branches in Boston, Chicago, San Francisco and Portland, Oregon.
125 years of growth 1832-1957



You Can Standardize
with profit on
GREENLEE TOOLS
FOR
MORTISING
BORING
ROUTING

TOOLS FOR CRAFTSMEN
GREENLEE

WRITE FOR CATALOG 34-M

This easy-to-file, 20-page catalog is packed with information you'll find useful in ordering Greenlee Tools for all your needs. All carry the famous Greenlee guarantee of quality. See your own jobber or write us for name of a distributor in your area.

GREENLEE
TOOL CO.
Division of Greenlee Bros. & Co.
2463 HERBERT AVE.
ROCKFORD, ILLINOIS

dark oak, golden oak, light oak, mahogany, and walnut
STEEL WOOL — No. 0 and No. 2/0
TURPENTINE
TWINE
VARNISH — coach, flat, remover, spar, and rubbing
WASTE — cotton, white
WAX — bees and finishing
WHITE LEAD

News Notes

FINE FINISHES FOR LIVING ROOMS

The third full-color folder on finishes for woodwork and paneling entitled "Fine Finishes for Living Rooms," has just been published by the Western Pine Association.

The publication joins two previously published items of similar format which have become among the most popular pieces of literature ever published by the Association. These are "Fine Finishes for Family Rooms," and "Fine Finishes for Kitchens."

Each in the series contains actual color reproductions of specially created stain finishes applied to Western Pine species. Recipes for each of the finishes are also furnished, along with general hints on the finishing of wood surfaces and several colorful photographs of home interiors where color stains have been used with outstanding effect.

Single copies of the new publication, as well as the two earlier in the series, may be obtained by writing the *Western Pine Association, 510 Yeon Bldg., Portland 4, Ore.*

U. S. FOREST PRODUCTS LABORATORY TO HOLD DEMONSTRATION

The U. S. Forest Products Laboratory, Madison, Wis., which has been engaged in wood seasoning research since 1910, will concentrate the results of its investigations into two weeks of intensive work during the 81st Kiln-Drying Demonstration to be held here, April 1 to 12, 1957.

These demonstrations have been conducted since 1919 to help the wood seasoning industry by making laboratory findings available in simple, easy-to-use form, according to Dr. J. A. Hall, Laboratory director. Proper seasoning, he pointed out, is of basic importance in many fields of wood use and can mean the difference between profit and loss for a plant or company.

Because proper seasoning is essential in the use of wood for all kinds of construction, the demonstration is open to architects, lumber wholesalers and retailers, contractors, and woodworking specialists, as well as kiln operators and supervisors. Application blanks can be obtained on request.

To make the attendance as valuable as possible to participants interested in other phases of wood utilization, the facilities of the Laboratory will be made available for discussion of special problems, such as machining, gluing, preservation, control of stain and decay, and strength properties of wood.

Participants in the 80 demonstrations held since 1919 have come from all over the United States, Canada, Latin America, Europe, and Asia.

♦ A new four-year curriculum leading to a B.A. degree in industrial technology is now offered at St. Cloud Teachers College, St. Cloud, Minn. This program is intended for students who seek employment in industry in other than teaching positions. It is sponsored by the Industrial Education Department of the College and includes a broad major drawn from the industrial area plus related courses in business, economics, geography, etc. (Continued on page 58A)

all-new shop and mechanical drawing equipment by Hamilton

These are just four of the many units in Hamilton's new line of Arts and Crafts Equipment. The work benches, drafting tables, and wealth of storage cases and cabinets to be found here offer a fine range of equipment for almost any shop or mechanical drawing classroom. You'll find it's the most complete and highly functional line available. And it's described in Hamilton's new Arts and Crafts Catalog 219. Write for your free copy now!

Hamilton

Arts and Crafts equipment

Ready for you now! 64 pages, with full color illustrations of selected products, finishes and colors. Write today!

HAMILTON MANUFACTURING COMPANY • TWO RIVERS, WISCONSIN

AUTOMOTIVE EQUIPMENT

(Continued from page 26A)

7. 10" round bastard (6 minimum)
8. Ignition point file (10 minimum)
9. Regulator point file, Delco-Remy model W-19
10. 6" saw file, extra slim taper (4 minimum)
11. Warding, 6" smooth (4 minimum)

FUSES — automobile Nd. 3 ag, 20 amp.

GASOLINE — commercial grade (as needed)

GAUGE (thickness gauge)
1. .002" thickness, ½" width, ground thickness gauge stock
2. .003" thickness, ½" width, ground thickness gauge stock
3. .005" thickness, ½" width, ground thickness gauge stock
4. .010" thickness, ½" width, ground thickness gauge stock
5. .015" thickness, ½" width, ground thickness gauge stock

GREASE
Chassis, purchase in quantity depending on amount used

GRINDING COMPOUND
2 compartment oil mixed grades A & E

GRINDING WHEELS
When requesting grinding wheels for replacement purposes, be sure to specify the material bond, grain, size, and hardness or grade

HANDLE, HAMMER
1. 14" length, 16 oz. machinist's
2. 18" length, 24 oz. machinist's

HOSE
1. ¾", rubber, 2 ply, 50' lengths
2. Radiator hoses are molded for specific cars

HOSE CLAMPS
Universal type, to fit 1" to 3" O.D. hose

HYDRAULIC BRAKE FLUID

HYDROMETER FLOATS
1. Automobile storage battery, hydrometer float only
2. Automobile radiator hydrometer float only, calibrated for alcohol, glycerine, and prestone

INSULATOR
1. Rubber to fit mueller No. 85 clips, red mueller No. 87
2. Rubber to fit mueller No. 85 clips, black mueller No. 87

NUTS, MACHINE SCREW
1. No. 6–32, hex, steel
2. No. 8–32, hex, steel
3. No. 10–24, hex, steel

NUTS
1. ¼"–20 hex, semifinished
2. 5/16"–18 hex, semifinished
3. ⅜"–16 hex, semifinished
4. 7/16"–14 hex, semifinished
5. ½"–13 hex, semifinished
6. ¼"–28 hex, semifinished
7. 5/16"–24 hex, semifinished
8. ⅜"–24 hex, semifinished
9. 7/16"–20 hex, semifinished
10. ½"–20 hex, semifinished

NUTS
1. ¼"–28 castellated hex, semifinished
2. 5/16"–24 castellated hex, semifinished
3. ⅜"–24 castellated hex, semifinished
4. 7/16"–20 castellated hex, semifinished
5. ½"– castellated hex, semifinished
6. ¼"–20 castellated hex, semifinished
7. 5/16"–18 castellated hex, semifinished
8. ⅜"–16 castellated hex, semifinished
9. 7/16"–14 castellated hex, semifinished
10. ½"–13 castellated hex, semifinished

OIL — S.A.E. No. 30, engine oil (as needed)

PAINT (for shop maintenance)
1. Black, quick drying enamel
2. Red, quick drying enamel
3. White, quick drying enamel
4. Machine enamel, gray

PANS
Automobile drain pans, approximately 3 gallon capacity, height not to exceed 5", galvanized

PLUGS
1. Attachment, molded soft rubber two prong, body only
2. Attachment cap only
3. Three prong for grounding

RAGS
Wiping, bleached and washed. (Some schools may prefer to use wiping rags supplied and washed by a local laundry service)

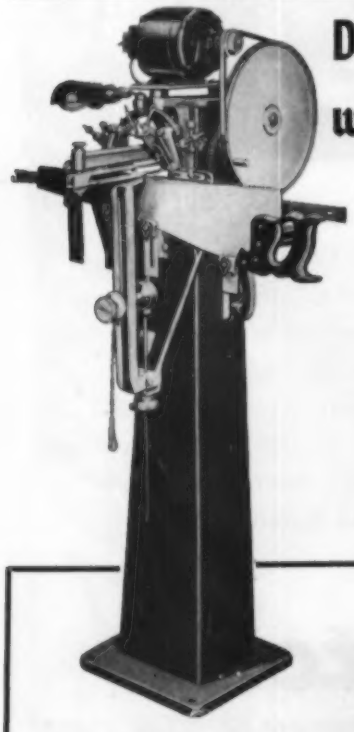
SAFETY WASHERS (grinding wheel)
Order by pair, specify arbor size and diameter flange for grinding wheels

SALAMMONIAC — for cleaning soldering coppers

SANDPAPER
1" width, No. 00, 50 yd. roll for commutators

SCREWS, MACHINE
No. 6–32 x 1", round head
No. 8–32 x 1½", round head
No. 10–24 x 2", round head

(Continued on page 44A)



Double saw life—train your students better with FOLEY SAW FILING EQUIPMENT

EXCELLENT STUDENT TRAINING

Train your students to use Foley machines. They will do better work with Foley sharpened saws. Foley equipment is safe to operate and is widely used by hundreds of schools, colleges, industries, Army, Navy, Air Force, etc.

FASTER SAW RECONDITIONING

You can sharpen 4 to 6 hand saws per hour with these three Foley Automatic power machines — Retoother, Saw Filer, Setter.

VOCATIONAL REHABILITATION

Foley Saw Sharpening Machines have proven their value for making physically handicapped persons self-supporting in their own business. Write us for full details.

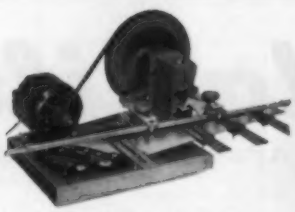
30-DAY FREE TRIAL

Any Foley machine may be installed on 30 day FREE Trial. Write today for detailed information.

FOLEY MANUFACTURING CO.
3318 N.E. 5th St. Minneapolis 18, Minn.

FOLEY SAW FILER

Files hand, band and cross-cut circular saws with machine accuracy. The saw is clamped in carrier which feeds it through all 3 machines for retoothing, filing, setting.



FOLEY RETOOTHER

Cuts new teeth in old saws (either straight or crowned edge) in one run through machine.

FOLEY SETTER

For both hand and band saws. Sets teeth on both sides in ONE run with perfect machine accuracy.

NEW FOLEY GRINDER

Low cost Foley 314 Grinder sharpens circular saws up to 44" diam.; also dado heads, rotary power lawn mower blades, scissors, sharp edged tools. Sands, buffs, polishes.

4-POSITION WOODWORKING BENCHES with locker base. 64 x 54 x 2¼ in. laminated wood top, 12 individual lockers. 2-position units have 64 x 24 or 30 x 2¼ in. laminated wood top and 6 individual lockers. Vises and other accessories available.

Take your pick of these Standard Hallowell Woodworking Benches

—they cost much less than custom-designed units, are extremely rugged, functional and attractive

Outfit a shop around these HALLOWELL Woodworking Benches. Like all other HALLOWELL School Shop Furniture, they are specially designed for use in industrial arts and vocational shops. And they have the design and construction features, materials and quality that have made HALLOWELL shop equipment a leading line throughout industry for many years.

Just one group of units in the complete HALLOWELL School Shop Furniture line is illustrated here. See our bulletin, Form 2246, for all units. Write for your copy today. Hallowell Shop Equipment Division, STANDARD PRESSED STEEL CO., Jenkintown 74, Pa.

STANDARD PRESSED STEEL CO.

HALLOWELL® SHOP EQUIPMENT DIVISION SPS

JENKINTOWN PENNSYLVANIA

4-POSITION WOODWORKING BENCHES with cabinet base. All-welded interlocked deep flange construction. 64 x 54 x 2¼ in. laminated wood top. 2-position benches have 64 x 24 or 30 x 2¼ in. laminated wood top. Vises and other accessories available.

4-POSITION WOODWORKING BENCHES with open base. 64 x 54 x 2¼ in. laminated wood top. 2-position benches have 64 x 24 or 30 x 2¼ in. laminated wood top. Available in 3 heights: 31¼, 33½, 35¾ in. Vises, shelves and other accessories available.

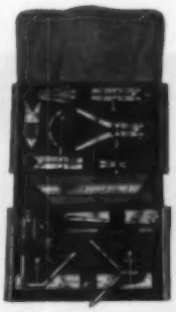
Starrett® tools

that help your boys make faster progress on precision work

Starrett makes tools for the student and apprentice as well as for the finished craftsman. Here are some of the more than 3000 items shown in the big new Starrett Catalog No. 27. Send for your free copy.

SET OF TOOLS NO. 900

Eight basic tools in a black leatherette case: 6" combination square with center head; 6" rule with pocket case and clip; center punch; center gage; 4" inside, outside and hermaphrodite calipers; 4" dividers.

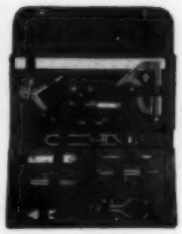


SET OF TOOLS NO. 901

Similar to Set No. 900 except tools are furnished in strong, attractively finished wood case plus a copy of "The Starrett Book for Student Machinists."

SETS OF TOOLS NO. 902 SERIES

More complete sets in durable, folding, artificial leather cases. No. 902A has 9" square; No. 902B 12" square plus 1" micrometer, center gage, center punch, 6" rule, 4" inside and outside calipers, dividers and hermaphrodite calipers.

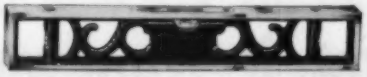


NO. 22C 59 DEGREE DRILL POINT GAGE

Measures drill lip lengths and insures correct 59° point angles for best cutting. Also serves as plain rule, hook rule, depth gage, try square and slide caliper.

NO. 132 BENCH LEVEL

A moderately priced precision level with main vial and double plumbs. 4", 6", 9", 12" and larger sizes. Black wrinkle finish with machined bearing surfaces. Base grooved for use on cylindrical work.



Other Useful Dependable STARRETT TOOLS

No. 436 Outside Micrometer Caliper, one inch
No. 124A Inside Micrometer
No. 11 Combination Square, 12 inch
No. 1010 Dial Indicator Pocket Gage
No. 815 Toolmakers' Hammer
No. 86A Combination Hand Vise
No. 596 Pencil Divider
No. 54 Hold Downs
No. 196A Universal Dial Test Indicator
No. 29 Scratch Gage
No. 56A Toolmakers' Surface Gage
No. 172A Thickness Gage
No. 70A Pocket Scribers
No. 500 Steel Pocket Tape, 72 inch
No. 530 Steel Case Tape
No. 711F "Last Word" Dial Test Indicator
No. 50A Improved Trammels
No. 93A T-Handle Tap Wrench
No. 132 Bench Level, six inch
No. 129 Bench Block
No. 236H Depth and Angle Gage
No. 135 Pocket Level
No. 165 Double End Pin Vises
No. 166 Pin Vises
No. 579 Telescoping Gages
No. 185 Tap and Drill Gage
No. 187 Jobbers' Drill Gage
No. 167 Radius Gages
No. 829 Small Hole Gages
No. 555 Jewelers' Screw Drivers
No. 6 Screw Pitch Gage
Kleenscribe Layout Dye
Starrett Tool and Instrument Oil

NEW HIGH SPEED WELDED EDGE HOLE SAWS

Double welded and shatterproof. For cutting clean, round holes in any machineable material. Sizes from 9/16" through 6" diameter.

NO. 153 HACKSAW FRAME

Adjustable for 8, 10 or 12-inch blades. Sturdy satin finish frame with tough rubber pistol grip. An ideal frame for use with Starrett hand hacksaw blades.

Starrett Tool Oil is made to our specifications and used by us to protect and preserve tools and instruments. Handy 3¼ fl. oz. can.

"Kleenscribe" Layout Dye is a quick drying, easy-to-use blue layout dye in a practical small container. 4 fl. oz. can with brush in cap.

Starrett

SINCE 1880
WORLD'S GREATEST TOOLMAKERS

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR
Prompt delivery
Dependable service
Quality products

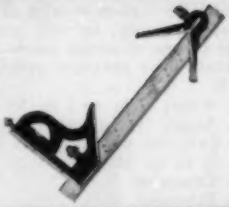
Starrett

BASIC TOOLS for SCHOOL SHOPS

In your purchase of tools for your shop classes, buy for your boys the tools they will eventually buy for themselves . . . genuine STARRETT TOOLS. In the complete STARRETT line, there are tools for every purpose at prices that fit school shop budgets.

No. 436RL 0–1" micrometer with Satin Chrome Finish on sleeve and thimble, black enameled frame.

No. 224A-RL 2–6" micrometer with interchangeable anvils — a popular mike for automotive and metal-working classes.



No. 11 Combination Square with Center Head has easy-to-clean black wrinkle finish. Available in 4, 6, 9, 12-inch and larger sizes.

6, 12, 18 and 24-inch steel rules with Satin Chrome Finish (pioneered by Starrett). Flexible or spring tempered types, fractional or decimal graduations.

No. 56 Surface Gage for use on round work or flat surfaces has 2½" base, 4" or 7" spindle, gage pins in base, fine adjusting screw.

No. 117 Center Punches are hardened on both ends for safety and long life. Made with round shank, knurled grip, accurately centered tips.

FREE EDUCATIONAL AIDS

New Bulletin 1203, "How to Read, Use, Care for Micrometers and Vernier Gages."

Training Aids Bulletin No. 1202 shows the complete line of Starrett training aids.

Big new Catalog No. 27 shows the complete line of Starrett tools. Write for free copies. Address Dept. (CE), The L. S. Starrett Company, Athol, Massachusetts, U.S.A.

STARRETT 16MM SOUND MOVIE

"The Tools and Rules for Precision Measuring"

AVAILABLE FOR FREE SHOWING TO YOUR SHOP CLASSES

Tells the story of precision measuring in 30 interest packed minutes. Arrange for a free showing to your group.

- Highlights in the history of precision measuring
- Precision measuring from basic rules to latest precision methods
- The tools and instruments that make precision possible
- Now, simplified instruction: How to use and read the Micrometer and Vernier tools.

Starrett

SINCE 1880
WORLD'S GREATEST TOOLMAKERS

Buy THROUGH YOUR INDUSTRIAL DISTRIBUTOR
Prompt delivery
Dependable service
Quality products

MECHANICS' HAND MEASURING TOOLS AND PRECISION INSTRUMENTS
DIAL INDICATORS • STEEL TAPES • PRECISION GROUND FLAT STOCK
HACKSAWS • HOLE SAWS • BAND SAWS • BAND KNIVES

Electrical-Shop Equipment, Supplies, and Motor Testing Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films and silent or sound movies may be used by the students in the industrial arts and vocational education courses.

BENCH GRINDER
BENCHES — plain or with drawers, for tools and equipment, or with compartments for the storing of wiring panels. Preferably they should have electrical outlets
BITS
1. Auger, ¼ in. to 1 in. by 16ths
2. Auger, 11/16 in., 18 in. long
3. Drill for wood, square shank, ⅛ in. to ½ in. by 16ths
4. Expansion
5. Extension, 18 in.
6. Screw driver, ¼ in.

BLACKBOARD — permanent or portable
BLOWTORCHES — 1-qt. size
BOOKCASE
BRACES — ratchet type, 8-in. swing
BULLETIN BOARD
CABINETS — wood or metal for filing class records, instruction sheets, drawings, etc.
CHAIRS — teacher's and tablet arm
COMPASS SAW
COIL
1. Spreader
2. Taper
3. Winder

DESK — teacher's, with drawer compartments
DRILL
1. Breast
2. Concrete, ⅜ in., ½ in., ¾ in., 1 in.
3. Hand
4. Portable, electric
5. Twist, 1/32 in. to ½ in. by 64ths

DRILL PRESS
1. Bench, hand, or power driven
2. Heavy, power driven

FILES
FIRST-AID CABINET AND SUPPLIES
HACK SAW
1. Blades, 10 in., 24 tooth
2. Frames adjustable

HAMMERS
1. Claw, 12 oz.
2. Machinist's, ball peen

HICKEY — ½ in. and ¾ in.
HOLE SAWS — selected sizes
LATHE
1. Engine, 10-in. or 12-in. swing, 6 ft. or 8 ft. long
2. Speed

PLIERS
1. Gas, 6½ in. and 8 in.
2. Side cutting, 6 in.

PUNCH — for metal molding
PUNCHES — assorted
REAMERS
1. Pipe burring, ¼ in. to 1 in.
2. Pipe burring, ½ in. to 2 in.

RULES
1. 48 in. zigzag
2. 72 in. zigzag

SCREW DRIVERS — 3 in., 5 in., and 8 in.
SHEARS — for cutting metal molding
SOLDER DIPPERS
SOLDERING COPPERS
1. Assorted
2. Electric
3. Handles

STOCKS AND DIES — for pipe threads, ½ in. to 1 in.
VISES
1. Machinist's, 4 in.
2. Pipe

WRENCHES
1. Adjustable, 6 in. and 8 in.
2. Pipe, 10 in., 12 in., and 14 in.
3. Socket, combination

Electrical Shop — Supplies

ABRASIVE CLOTH — aluminum oxide, 1, 1½, and 2 in. wide
ARMORED CABLE
1. 2 wire, No. 14, single strip
2. 3 wire, No. 14, single strip
3. Box connectors

ATTACHMENT PLUG
BAR HANGERS
BATTERIES — dry cells
BATTERY ACID — 1.300
BATTERY SEALING COMPOUND
BOX CLEATS
BRADS — ¾ in., No. 19 and 1½ in., No. 16
BRAKE LINING — ¼ by 2 in.
BRUSHES — carbon, for motors and generators
BURGLAR CONTACTS
1. Open circuit
2. Closed circuit

BUSHINGS
1. Loom, No. 1 and No. 2
2. "Jiffy" loom, No. 2

BUZZERS
CLEATS — unglazed porcelain, 2 wire
CLIPS — test, with insulators, Universal, Nos. 22, 23, 24 and 25
COMMUTATOR CEMENT
CONDUIT
1. Bushings, ½, ¾, and 1 in.
2. Box connectors, for flexible
3. Couplings, for flexible
4. Lock nuts, ½, ¾, and 1 in.
5. Rigid, ½, ¾, and 1 in.

CONDULET
1. Fillings, ½ in., LL, LR, and LB
2. Covers, ½ in., blank

DOOR OPENERS — mortised
FISH PAPER — .0125 in. thick
FIXTURES — brass, chain, suspension
FIXTURE STUDS
FUSES
1. Plug type, renewable, 125 volt, 15 amp.
2. Cartridge type, renewable, 125 volt, 30 amp.
3. Renewals for plug fuses
4. Renewals for cartridge fuses

GROUND CLAMPS — ⅜ to 1 in. assorted
HICKEY GRIPS — ½ and ¾ in.
LAMPS
1. Mazda, selected as wattages and voltages
2. Guards for brass sockets

LEATHER NAIL HEADS
LUGS — 25 and 50 amp.
LUMBER — 2 by 4 in. by 14 ft., No. 1, white pine dressed, 4 sides
MOLDING
1. Metal
2. Metal, fittings — crosses, T's, internal elbows, junction boxes, switch bases, keyless receptacles, snap switches

NAILS — roofing
NUTS — iron, 4-36, 6-32, 8-32, 10-24, 12-24, 10-32, 14-20
OUTLET BOXES — 4 in. square, with one round blank cover, and one cover with bushed opening
PIPE STRAPS — galvanized, ⅜, ½, ¾, and 1 in.
PUSH BUTTONS
1. Return call, 3 point
2. Single

RECEPTACLES
1. Flush, duplex
2. Porcelain cleat, 660 watt, 250 volt
3. Concealed
4. Covers

RECTIFIERS — Tungar, for charging from 1 to 12, 6- and 12-volt batteries
RELAYS — Dixie
RESISTANCE BOARDS — for testing
RESISTANCE UNITS — 125-ohm
RHEOSTATS
1. Compression, 275 watt
2. Field, for shunt and compound motors

ROSETTES — wood
ROTARY CONVERTER — 5-kw. capacity, 3 phase a.c., 110 volt d.c.
SCREWS
1. Anchors, 8/32, 10/24, 12/24, 14/20
2. Machine, roundhead, 4-40 by ¼ in., 6-32 by ½ in., 6-32 by ¾ in., 8-32 by ¾ in., 8-32 by ½ in., 8-32 by 1 in., 10-32 by ¾ in., 10-24 by ¾ in., 10-24 by ¾ in., 10-32 by ¾ in., 12-24 by 1 in.
3. Machine, brass, roundhead, 4-40 by ¼ in., 6-32 by ½ in., 6-32 by ¾ in., 8-32 by ½ in.
4. Wood, flathead bright, No. 5 by ¾ in., No. 8 by ½ in., No. 8 by ¾ in., No. 8 by 1 in., No. 7 by 1½ in, No. 8 by 1½ in., No. 7 by 2 in.
5. Wood, roundhead blued, No. 7 by 1 in., No. 8 by 1½ in., No. 10 by 1½ in., No. 7 by 2 in.

SLEEVING — No. 1, white; No. 1, blue; and No. 1, red
SOCKETS
1. Brushed, brass pull chain, keyless, key
2. Porcelain, keyless, with caps
3. Porcelain, key, with caps

SOCKET CAPS — ¼ and ⅜ in. bushed
SOLDER WIRE — 50/50 size, No. 10
SOLDERING PASTE — 2-oz. cans, noncorrosive
SOLDERING SALTS — 1-oz. cans, noncorrosive
SPEED COUNTERS — 0-9999
SPLIT KNOBS — porcelain
SPRING BALANCES — 0-30 lb.
STARTING BOXES
1. For compound motors, various makes
2. For shunt wound, 1 h.p., 110-volt motors. Overload release
3. For shunt wound, 1 h.p., 110-volt motors. No voltage release
4. Starting devices of various makes and principles, for 1 h.p., 3-phase, 220-volt a.c. motors

STORAGE BATTERIES — 6 volt
SWITCH
1. Battery, 4 point
2. Bases, porcelain, for 10-amp. switches
3. Boxes, 2¾ in. deep
4. Entrance, safety, 2 pole, 30 amp., with 2-branch lighting circuits
5. Entrance, safety, 3 pole, 30 amp., 250 volt
6. Flush, push button, S.P., D.P., 3 way, 4 way
7. Surface, S1, S3, and S4
8. Knife, type A, D.P.S.T., D.P.D.T., S.P.S.T., and S.P.D.T.
9. Surface, snap, electrolier
10. Surface, snap, S.P.D.P., 3 way, 4 way

SWITCHBOARD — as required
TACKS — double-pointed No. 10
TAPE
1. Friction, ½-lb. rolls
2. Rubber, ½-lb. rolls

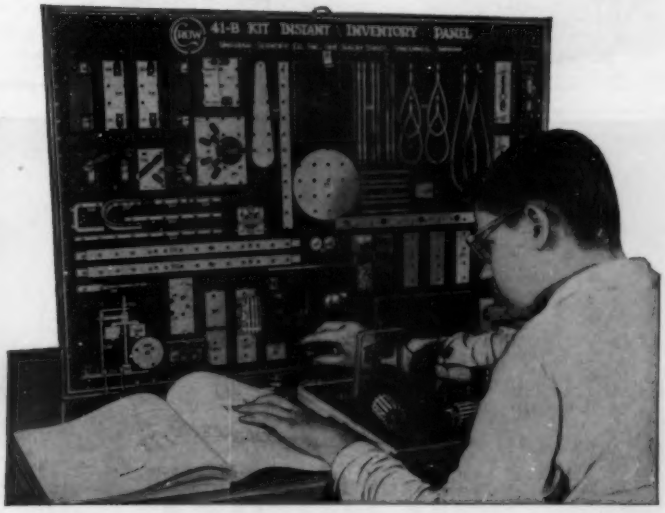
TELEGRAPH SETS — including sounders, keys, and relays
TELEPHONES
1. Complete bridging, independent phones

(Continued on page 42A)

the case of the missing components

solved by
Crow's new

"INSTANT INVENTORY PANEL"



● Understanding of any subject is greatly accelerated when students take an active, *creative* part in the learning process. Conclusive evidence of this fact has been the success of Crow Electri-Kits in Electricity and Electronics courses throughout the country. These "learn-by-doing" kits have, however, created a certain problem for the classroom instructor: How to keep the kit's many small components from turning up missing?

Some instructors have been understandably reluctant to cope with this problem, especially where large classes are concerned. They're due for a change of heart, though, when they learn about Crow's new "Instant Inventory Panel."

This panel is the last word in simplicity and practicality. It's a 24″ x 36″ board of tempered Masonite, reinforced with an aluminum frame. On the front are brackets and clips for mounting all kit parts. Moreover, these parts are silhouetted in bright, contrasting color . . . teacher and student can tell immediately when a part is not in its proper place because the panel shows both the shape and number of the missing part.

For you, the user of Crow Electri-Kits, the "Instant Inventory Panel" provides several important advantages:

1 **Saves Students' Time**—Makes all parts instantly accessible . . eliminates the irritation of searching for a small part right in the middle of an experiment.

2 **Saves Instructor's Time**—Permits easy replacement of parts by student and instant inventory at the end of each class.

3 **Saves Components**—Calls immediate attention to a lost or missing part.

4 **Saves Space**—Panels are designed to hang on wall or to suspend from uprights on work bench. Can be used with any bench and stored in case when not in use.

5 **Saves Money**—The same kit can be used by many classes every day. For example, 20 kits would serve five classes of 20 students each and give all 100 students an individual kit. Ten kits would suffice if two students were assigned to a kit in each class

Crow Electri-Kits now offer a complete "package" for effective visual-experiment instruction in Electricity and Electronics: components, student text-manuals, study guides, and the new "Instant Inventory Panel." Panels are available for all Crow "Student Experiment" Electri-Kits. Also available is a compact case for storing four kits (including panels) when not in use.

Write for full details and be sure to ask about Crow's FREE Shop Counseling Service.

CROW ELECTRI-CRAFT CORP. | Division of Universal Scientific Co., Inc.
1102 SHELBY STREET • VINCENNES, INDIANA

(Continued from page 40A)

2. Couch vestibule telephones
3. Receivers, transmitters, induction coils, condensers, and bridging switch hooks

TRANSFORMERS
1. Bell ringing, 6, 8, 14 volt
2. Single phase, 110–220 volt, S.K.V.A.

TUBES — porcelain, 5/16 by 3 in., 5/16 by 5 in., and 5/16 by 10 in.

TUBING — flexible nonmetallic, 1/4 and 3/8 in.

WASHERS
1. Iron, 1/4 and 3/8 in.
2. Brass, 1/4 and 3/8 in.

WIRE
1. Annunciator, No. 18 or No. 20
2. Fixture, No. 18, single yellow, with marker
3. Rubber covered, solid copper, No. 10, black
4. No. 10, white
5. No. 14, black
6. No. 14, white
7. Rubber covered, No. 16, brewery cord
8. No. 18, lamp cord, green and yellow
9. S.C.C. copper magnet, enameled, sizes Nos. 16 to 26 inclusive

Electrical Shop — Motor and Testing Equipment

ANNUNCIATORS
1. Automatic needle drop
2. Gravity drop
3. Manual needle drop

ARMATURES — burnt out, for repairing

BATTERY CHARGER — commercial

CIRCUIT BREAKERS
1. Air, single pole, overload, 25 amp., 550 volt
2. Air, single pole, underload, 15 amp., 550 volt

CONTROLLERS
1. For multiple-speed motor
2. For 1 h.p., 110-volt series

GENERATORS
1. Motor-generator set, 10 h.p. to supply 110-volt d.c. for testing purposes, battery charging, etc.
2. Generator, 6-volt d.c. coupled to an a.c. motor for 6-volt circuit testing
3. Auto generators of different makes

GRAVITY CELLS

MAGNETS — testing, 10,000 ohm

METERS
1. Ammeter, standard, 60 amp., a.c.
2. Ammeter, standard, 60 amp., d.c.
3. Ammeter, student, 60 amp., a.c.
4. Ammeter, student, 60 amp., d.c.
5. Voltmeter, standard, 0–10 volt, d.c.-a.c.
6. Voltmeter, standard, 110–220
7. Voltmeter, standard, 125 volt
8. Voltmeter, standard, 125 volt, d.c.
9. Voltmeter, student, 110 volt, d.c.
10. Voltmeter, student, 110 volt, a.c.
11. Wattmeter, standard, 110–220 volt, 30–60 amp., d.c.-a.c.
12. Wattmeter, student, 110–220 volt, 30 amp., a.c.-d.c.
13. Watt-hour meter, 125 volt, 5 amp., a.c., single phase, various makes

MOTORS
1. Auto starter, different makes
2. Burnt out, fractional h.p., 110 volt, 60 cycle, for repairing
3. Compound, 1 h.p., 110 volt, d.c.
4. Multiple speed, 1 h.p., 3 phase, 220 volt
5. Series, 1 h.p., 110 volt, d.c.
6. Shunt, 1 h.p., 110 volt, d.c.
7. Split phase and repulsion, a.c., 110 volt, single phase, assorted
8. Split phase induction motors, fractional h.p., 110 volt, 60 cycle, different makes
9. 3 phase, 1 h.p., a.c., 220 volt, various makes
10. 3 phase, 2 h.p., 220 volt, a.c., various makes
11. Universal, fractional h.p., 110 volt, different makes
12. Universal, variable speed, 1/2 h.p.

PLATFORM SCALE — 110 lb. capacity

FREE teaching aid

Helps students to learn the difference between minimum "Code" wiring and wiring that provides a home with full HOUSEPOWER. Simple, easy-to-understand; will encourage class discussion. The project has been specifically prepared by The National Adequate Wiring Bureau in response to requests by vocational teachers for material about adequate wiring.

ELECTRICAL PLANNING FOR TODAY'S HOMES is presented in the form of a series of true-false questions and answers. It interprets technical theory in terms of the householder's daily use of electricity, based on the standard contained in the Residential Wiring Handbook developed by the Industry Committee on Interior Wiring Design.

Send for this free teaching aid today.

National Adequate Wiring Bureau, 155 E. 44 Street, New York 17, N. Y.

Please send me free copy of teaching aid "Electrical Planning for Today's Homes."

Name_____
(Please print)

School_____

Street_____ City_____ Zone____ State_____

♦ Science and mathematics teachers who worked in industry last summer as part of a pilot project proved they could practice what they preached. All but one of thirty-five received passing marks on their "report cards."

This was disclosed in a report made recently by the Industry-Education Committee headed by Samuel Schenberg, science supervisor of the board of education, New York City. The committee includes representatives of 17 large organizations that employed the teachers.

The results of the experiment were so promising that the project will be continued next year with possibly 75 teachers participating. Mr. Schenberg said plans were being completed to extend the plan to high school juniors and seniors.

Dr. William Jansen, superintendent of schools, who issued the report, said that students who took part in the project will not be in competition with college students.

The teachers proved successful in fields including research, development, chemical analysis, mathematical surveys, writing of instructional manuals, appraisals and testing. Most of the teachers said they would like to do it again next summer. All agreed that their experiences would make them better teachers.

SPECIFY
BUILT for ACCURACY

Hotpack TRADE MARK

EQUIPMENT
AND LONG SERVICE

HEAVY DUTY

No. 7021

NEW HIGH TEMP. KILN

Temperature to 2350° F.

Fast come-up time 5 hrs. to 2300° F. 7" of insulation, including interlocked 2500° F. brick. Controls grouped in eye-level panel, recessed with special plexiglass cover to prevent unauthorized adjustment while in operation. Many other features.

SPECIFICATIONS

Interior Size	Watts	Price F.O.B. Phila.
10"x9½"x9"	28 KW 230 volts	$225.00

NEW IMPROVED METAL ENAMELING KILN

Fast come-up time, 60 minutes to 1500° F. Uniform heating from floor refractory; high grade coiled heating elements. Unique front door opening prevents heat loss, eliminating possibility of dangerous accidents. Many other features.

SPECIFICATIONS

Interior Size	Watts 115 V	Price F.O.B. Phila.
12"x11"x5"	12 Amps	$85.00

No. 7033

PLASTIC PRE-HEATING Electric PORTABLE OVEN

No. 600

For preheating Methyl Methocrylate in sheet or rod form where it is necessary to maintain oven temperature throughout the sheet, especially desirable in compressed air, vacuum or pressure forming techniques.

The Oven is controlled by a newly developed thermostatic control, sealed in and conveniently placed on the front panel, of the Oven. It can accurately be set at any desired temperature where a quick rate of heat up to 306° F. is desired.

Due to the Aluminum Construction, the Oven is very light in weight and can be carried from the room or project to project. As it operates on 110 volt AC or DC, it can be plugged into any 110 volt receptacle.

SPECIFICATIONS

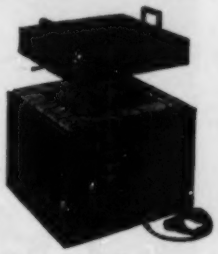
Model	Interior Size	Wattage 110 AC-DC	F.O.B. Phila. Price
600	12"Wx12"Dx12"H	700	$ 90.00
602	24"Wx12"Dx12"H	1400	145.00

Hotpack KILN KIT

EVERYTHING YOU NEED TO MAKE THIS PROFESSIONAL LOOKING ELECTRIC KILN

Large Chamber: 12" deep, 11" wide, 9" high YOU GET: Illustrated instruction Manual, Insulating Back Up Material, Insulated Cover & Handle, Wire — Screws — Terminal Board, Insulating Brick — cut to size, Sheet Metal Case — welded & painted, Hotpack Heating Elements, wired, 15 amps — 115 volts — Ready to install.

Prices Including Freight and Crating:
East of Denver — $52.00 West of Denver — $60.00



YOU NEVER FORGET to turn off your kiln with the

HOTPACK LIMITOR

Plug-in Type, 115 v., $14.95 Wire-in Type, 220 v., $27.95

No. 15

ELECTRIC PLASTIHEETER

Designed for Use in Plastic Courses in the School — a commercial type strip heater designed to heat sheets of Plexiglass or Lucite until they become soft and pliable for shaping to the form desired. It is essentially used for straight line bends or folds and is capable of heating sheet material up to ⅛" thickness in from 30 seconds to 4 minutes depending on the thickness of the contact with the heating element and the platen remains cool, there is no possibility of creating mark-off on the sheet.

SPECIFICATIONS

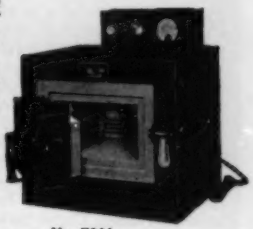
No.	Working Space	Overall Size	Wattage 115 Volt	Shipping Weight	F.O.B. Phila.
15	18"Lx5"Wx2½"H	21"Lx7"Wx3½"H	200 W	4 lbs.	$22.50
16	30"Lx5"Wx2½"H	32"Lx7"Wx3½"H	350 W	6 lbs.	35.00

CONTR. TEMP. KILN FOR ENAMELING ON COPPER

These units provide manual adjustment of temperature for kilns. They may be regulated so that current may be supplied to the kiln for any percentage of time per minute. This method of selection provides exact temperatures because the slightest movement of the control knob will vary the time of input, thereby raising or lowering the temperature as desired.

SPECIFICATIONS

Model	Interior Size	Price F.O.B. Phila.
7069	12"x12"x5½"	$170.00
7066	8"x 8"x5½"	130.00



No. 7066

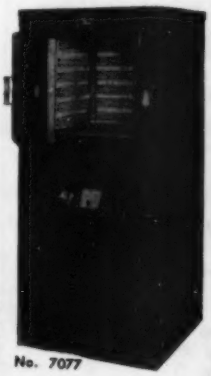
Hotpack ELECTRIC HEAT TREATING FURNACE

For Hardening, drawing, tempering and annealing or normalizing of dies, punches, gages, fixtures or other parts are performed readily with these redesigned Hotpack Electric Box Furnaces.

This new Hotpack Electric Furnace is fast heat-built for continuous use from 300° F. to 2000° F. It is the only Furnace equipped with Automatic Controlling-Indicating Pyrometer and also with Limistat control in this price field.

SPECIFICATIONS

Model	Interior Size W. D. H.	Current Characteristics	Prices F.O.B. Phila.
7076	8"x 8"x 5½"	110 V AC 15 Amp.	$265.00
7074	8"x 8"x11"	115 V AC 15 Amp.	295.00
7075	12"x12"x11"	220 V AC 23 Amp.	430.00
7077	15"x15"x16½"	200 V AC 30 Amp.	640.00
7079	12"x12"x 5½"	110 V AC 15 Amp.	305.00



No. 7077

WRITE FOR COMPLETE DETAILS — SEND FOR CATALOG

Hotpack ELECTRIC CERAMIC KILNS

No. 7004

1. Eye level controls — pilot light. 2. Built-in pyrometer for visible accurate temperature indication. 3. Handles are cool to touch. 4. Control switch — low, medium, and high heat for even distribution. 5. Special insulation holds heat and prevents scorching of table top. 6. Maximum temperature 2050° F.

SPECIFICATIONS

Model No.	Interior Size	Shelves Furnished	Approx. Time	Price F.O.B. Phila.
7006	8" 8"x 5½"	1	3 hrs.	$85.00
7004	8" 8"x11"	2	4 hrs.	115.00
7005	12"12"x11"	2	3 hrs.	250.00
7007	15"x15"x16½"	3	4 hrs.	460.00
7009	12"x12"x 5½"	1	4 hrs.	125.00

Enameling on copper can be efficiently fired on our models No. 7006 and 7009.

THE ELECTRIC Hotpack COMPANY, INC.

5067 COTTMAN AVENUE • PHILADELPHIA 35, PA.

Fibre-glass makes this new welder SHOCKPROOF! NOISELESS!

IDEAL FOR CLASSROOMS... SAFE—SILENT

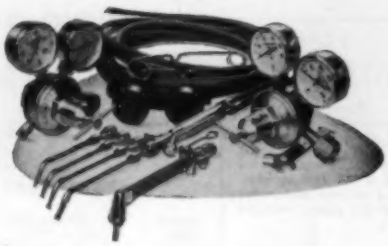
Marquette's new 90 Series Welder is best for classrooms because it is shockproof, noiseless and makes arc striking easier. Why? The welder is enclosed in tough, durable fibre-glass which is *non-conductive!* The "Perma-Shield" cabinet eliminates eddy current losses, noisy vibrations and shock-danger. This new welder is ten per cent more efficient and provides improved arc striking characteristics... advantages that teachers and students alike will welcome.

That's not all! The fibre-glass cabinet is rustproof, colorproof, waterproof and moisture proof. It's stronger than steel but lighter in weight and practically indestructible. The entire welder is best for training purposes because it's easier to operate (heat taps are clearly marked and safe, positive and easy to select), it's built to last longer and it will always keep its new appearance.

Two sizes in four models are available. One delivers a maximum of 200 amperes; the other, 275 amperes and each is available capacitor equipped, for increased power factor.

WHAT DOES ANODIZED ALUMINUM MEAN TO WELDING TORCHES?

It's new and Marquette's got it! Oxy-acetylene welding torches made of *anodized aluminum* make them 50 per cent stronger and 50 per cent lighter. Precision made, they're practically unbreakable and will stand years of rough handling. Makes them perfect for training schools. Eliminates factory service because they're equipped with fast change O-ring seals. Simply replace worn seals with new ones and the torch is ready for action in minutes time. Three models (Aero-Jet, Star-Jet and Super-Jet) are available for welding and cutting all thicknesses of metal.



WHAT KIND OF ROD DO YOU WANT?

Marquette makes a welding electrode or gas rod for every welding application. From its famous No. 130 Red Rod for getting deep penetration in dirty, rusty metal to its No. 15 Presto-Arc rod for high speed welding of sheet metal, Marquette offers the best for any shop. This range of rods includes high tensile, hard surfacing, cast iron, special alloys and bronze rods.

WRITE FOR THESE FREE FACT-PACKED BULLETINS

1 The 90 Series Arc Welder
2 Jet Series Welding Torches

When it Comes to Welding Come to

MARQUETTE
WELDING EQUIPMENT

Marquette Manufacturing Company, Inc., 307 East Hennepin Avenue
Dept. 6-420, Minneapolis 14, Minnesota

AUTOMOTIVE EQUIPMENT

(Continued from page 36A)

SCREWS, CAP
- ¼"–20 x 1¼", hex.
- 5/16"–18 x 1½", hex.
- ⅜"–16 x 1¼", hex.
- ½"–13 x 2", hex.
- ¼"–28 x ¾", hex.
- 5/16"–24 x 1¼", hex.
- ⅜"–24 x 1½", hex.
- 7/16"–20 x 1¼", hex.
- ½"–20 x 2", hex.

SHELLAC — white, 4 pound cut

SOCKETS, LIGHT
1. Dash light, double contact, 6 volt
2. Dash light, single contact, 6 volt

SOLDER, PASTE — all purpose, noncorrosive

SOLDER WIRE
No. 5 spools, ⅛" diameter, 50–50 alloy

SPARK PLUGS
1. 14 millimeter metric
2. 18 millimeter metric

STAPLES — insulated, ½"

TAPE
1. ¾" friction tape
2. ¾" rubber tape

TIRE REPAIR KIT
Garage size, red, 450 sq. in., ¼ pint cement

TIRE REPAIR CEMENT
½ pint can with brush in can

THERMOMETERS (Lab.)
Calibration 10° F.-220° F., 12" length, glass stem

TUBING FITTINGS
1. Flare nuts, 7/16" x 20 for ¼" sae flared fittings
2. Half union, ¼" sae flare x ⅛" standard pipe
3. Shut-off cocks, ¼" D.D. tubing on each end, compression type
4. Shut-off cocks, ¼" D.D. tubing on each end, sae flare type
5. Unions, ¼" compression type x ½" compression type
6. Unions, ¼" sae flare x ¼" flare
7. Unions, 5/16" sae flare x 5/16" flare
8. Unions, 5/16" compression type x 5/16" compression type
9. Shut-off cocks, 5/16" O.D. tubing on each end, compression type
10. Shut-off cocks, 5/16" O.D. tubing on each end, sae flare type
11. Sleeves, 5/16", compression sleeves
12. Nuts, 7/16" x 20 nuts for ¼" O.D. compression fittings
13. Flare nuts ½" x 20 for 5/16" sae flared fittings
14. Half union, ¼" tubing size, compression x ¼" standard pipe
15. Half union, 5/16" tubing size, compression x ¼" standard pipe
16. Sleeves, ¼" compression sleeves

TUBING
1. ¼" O.D. annealed copper, automative
2. 5/16" O.D. annealed cooper, automotive
3. 2¼" O.D. flexible metal, galvanized steel for exhaust lines

WASHERS, FLAT
1. ¼", 18 gauge thickness
2. 5/16", 16 gauge thickness
3. ⅜", 16 gauge thickness
4. 7/16", 14 gauge thickness
5. ½", 14 gauge thickness

WASHERS, LOCK
1. ¼"
2. 5/16"
3. ⅜"
4. 7/16"
5. ½"

WIRE
1. No. 18 single strand copper, cotton covered
2. No. 24 single strand copper, single cotton and enamel covered

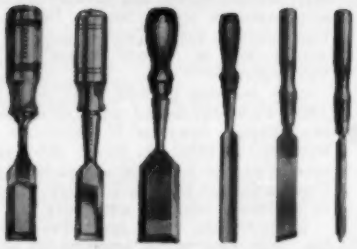
(Continued on page 54A)

GREENLEE 22 SOLID-CENTER AUGER BITS

Made with utmost care to assure free, easy boring and fast chip clearance. Solid-center design for extra strength, smooth operation. Accurately sized, perfect cutting edges. "Plastic-Sealed" to reach you factory-sharp. Can be purchased singly or in handy bench sets and steel boxes as shown at right (also in plastic rolls).

Better Shopwork with fine hand tools by GREENLEE

Good workmanship comes easily with GREENLEE tools. All are carefully formed and finished for accuracy and correct cutting edges and are properly heat-treated for long life. They are made by craftsmen for craftsmen.

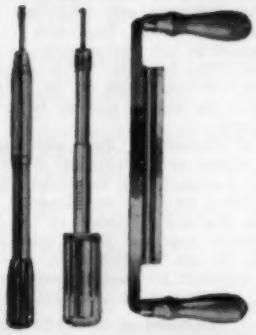


CHISELS, GOUGES, TURNING TOOLS

Various types of tang butt, socket butt and firmer chisels with durable green plastic or hickory handles. Outside and inside bevel socket gouges. Short and full-length turning tools.

EXPANSIVE BITS, DRILLS, ELECTRIC-DRILL BITS

Fast, easy-boring expansive bits with positive chip clearance. Two styles: Setfast with quick adjusting-locking feature, and Plain type. Wood-boring brace drills and solid-center electric-drill bits in various sizes.



SPIRAL SCREW DRIVERS, PUSH DRILLS, DRAWKNIVES

Free-running, fast action GREENLEE spiral screw drivers are available in two models: Enclosed Spiral for extra safety and grit-free operation, and Open Spiral. Automatic push drills are smooth operating with automatic spring return . . . handle holds eight drill points. GREENLEE drawknives are light in weight and have sturdy, rigid blades for accurate work.

The GREENLEE line also includes many other time-saving tools for students and shop workers: Bit Extensions, Electricians' Bits, Tubing Benders, Radio Chassis Punches, and many more. Write for free catalog No. 35-H.

TOOLS FOR CRAFTSMEN

GREENLEE

GREENLEE TOOL CO.

2023 Twelfth St., Rockford, Illinois

39TH ANNUAL CONVENTION

The 39th annual convention of the New Jersey Vocational and Arts Association will be held on March, 14, 15, and 16, 1957, at Asbury Park, N. J. The meetings will be conducted at the Berkeley-Carteret Hotel and Convention Hall.

Personal News

JOHN E. McGRATH RECEIVES APPOINTMENT

John E. McGrath, formerly director of the transportation program at the American University, Washington, D. C., has been appointed assistant director of education for the new Transportation Center at Northwestern University. He assumed his new duties on January 1, 1957.

Mr. McGrath will assist in the development of a broad educational program in transportation at the University and in planning and supervising short courses, seminars, and symposia in the transportation field.

Formerly a teaching associate in transportation at the Indiana University School of Business, and an instructor in transportation at the University of Missouri School of Business, Mr. McGrath has been on the American University faculty since 1955. He holds two degrees from the University of Chicago, where he majored in transportation, and a doctorate in business administration from Indiana University.

The Northwestern Transportation Center opened in fall of 1956. It provides education, basic research, and service to the transportation industry and the nation.

PROFESSOR AND INSTRUCTOR APPOINTED

Dr. Henry P. Messinger, has been appointed to the position of assistant professor of electrical engineering at the Illinois Institute of Technology, Chicago, Ill.

Dr. Messinger was a native of Vienna, Austria, and received a bachelor of science degree in electrical engineering from Oklahoma A. & M. College in 1943. In 1946 he was awarded a master's degree from Illinois Tech, and in 1950 a Ph.D., from the University of Illinois, specializing in electrical engineering as well as taking advanced study in mathematics, physics, and chemistry.

Leonard J. Eisenberg has been appointed instructor in physics at the Illinois Institute of Technology, Chicago, Ill.

A native of Chicago, Mr. Eisenberg attended Wright Junior College and was graduated from Illinois Tech with a bachelor of science in physics in 1951. He received a master's degree in physics from the Institute in 1955.

WESTERN PINE NAMES SAFETY DIRECTOR

James R. Grady, for 14 years with the Oregon State Industrial Accident Commission, and a member of the American Society of Safety Engineers, has been appointed safety director of The Western Pine Association, Portland, Ore.

The Association's board of directors created this post in an effort to promote greater safety consciousness in the Western Pine industry. It is designed to provide industry leadership in safety matters at management levels.

DR. PARK DIES AT 84

Dr. Joseph C. Park died on December 9, 1956 at the residence of his son, Joseph C. Park, Jr., at Wellsville, N. Y. Dr. Park served as director of the industrial-arts division of State University of New York Teachers College, Oswego, for 39 years.

Dr. Park was born at Big Flats, near Elmira, N. Y., in 1872, was graduated from Dundee Preparatory School and the Oswego State Normal School and received his bachelor and master of science degrees from Syracuse University. In 1932 he was awarded an honorary doctor of science degree by Alfred University.

After teaching in New York State several years, Park was named principal of the Cherokee Baptist Academy at Tahlequah, Indian territory, in 1896. He served there until his appointment as a member of the faculty of the Oswego College in 1901. Dr. Park was director of industrial arts here until 1941.

In 1927, Dr. Park spent five months in the Near East as an inspector of education for the Near East Relief Association. He was the author of several books and other publications on industrial arts education. One of these, entitled, "Facts Regarding Industrial Arts Teachers in 156 Communities," was published in 1916 by the U. S. Bureau of Education. "Woodworking in the School and Home" was the title of another book written by Dr. Park.

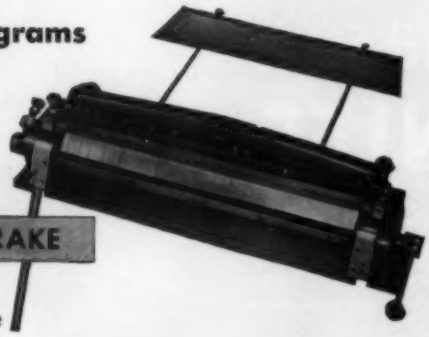
While at Oswego, Dr. Park was responsible for the editing and publishing of "The Vocationist," a magazine on industrial arts which was circulated on a national basis to various leaders in the field. Printed at the College, the magazine appeared from 1915 to 1939.

Besides his son at Wellsville, N. Y., Dr. Park is survived by another son, Dr. John W. Park, superintendent of schools in Albany,

(Continued on page 52A)

BERKROY 24" SHEET METAL TOOLS

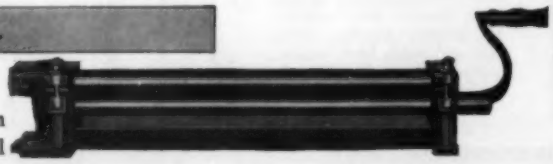
Enlarged Training Programs Possible With These Production Tools of Advanced Design



24" BOX AND PAN BRAKE

Turning a knob provides infinite adjustment to any angle from 0° to 135°. Forms any size box or pan from ½" to 24" by ¼" graduations. Makes intricate folds, reverse bends and radius bends on sheet metal up to 16 gauge and up to 24" wide. Bending leaf operates on Torrington Needle Bearings. Full 1" clearance between top fingers and anvil. Maximum 2½" box or pan depth permits deeper bends.

24" SLIP ROLL



Finger-tip controls on both ends of top roll permit quick adjustment for any material thickness of unit. Will accurately roll 24" widths in 20 gauge mild steel — heavier gauges in narrower widths. Removal of work is easily accomplished due to the spring loaded, hinged, top roll. Heavy duty rolls 1½" diameter — distortion proof channel iron base, enclosed gears and oilite bearings are a few of many features.

SOLD THROUGH INDUSTRIAL DISTRIBUTORS

For catalog information, write to
BERKROY PRODUCTS, INC.
2512 N. ONTARIO STREET • BURBANK, CALIFORNIA

Metalworking Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films, and silent or sound movies may be used by the students in the industrial arts and vocational education courses.

AIR COMPRESSORS — for machine shop, foundry, or forge shop
ANVIL — 100 lb.
ARBOR PRESS — bench or pedestal type
BARROWS
1. Coke
2. Foundry
3. Scrap
BELT LACER
BENCHES
1. Coremaking
2. For metal working, iron or steel legs. Tops, metal or hardwood lumber, 1¾ in. to 2½ in. thick
3. Molding
BLOWERS — for furnaces, forges, etc.
BLOWTORCH — 1-qt. size
BOOKCASE — for reference books, catalogs, etc.
BORING BAR
BORING MILL — vertical or horizontal
BULLETIN BOARD
CABINETS — wood or metal, for filing class records, instruction sheets, drawings, etc., and for tools and supplies
CASEHARDENING BOXES
CENTERING MACHINE
CHAIN HOISTS — differential, duplex or triplex
CHAIRS — teachers', and tablet arm if needed for related-subjects room, or for demonstration section
CHALKBOARDS — permanent or portable
CHUCK
1. Drill, selected sizes
2. Lathe, combination, 4 jaw, selected sizes
3. Lathe, independent, 4 jaw, selected sizes
4. Lathe, universal, 3 jaw, selected sizes
5. Milling machine, universal
CORE OVEN — for foundry
CRANES AND HOISTS — air, electric, or hand; of the jib, traveling, or portable type
CUPOLA — for foundry, coke, or electric, ¼- to 1-ton capacity
DESK — teacher's, with drawer compartments
DIE-FILING MACHINE
DIVIDING HEAD
DRILLS
1. Bench, hand
2. Breast
3. Electric, portable
4. Hand
5. Post, hand or power
6. Radial
7. Sensitive
8. Upright, power
FLASKS — 2 or 3 part, steel or snap type
FORGE — coal or gas, with hand- or electric-driven blower
FURNACES
1. Annealing
2. Bench
3. Brass and soft metal
4. Combination bench
5. Casehardening
6. Cyanide
7. Gasoline
8. Heat-treating
9. Melting
GEAR-CUTTING MACHINE
GRINDER
1. Bench, hand or power driven
2. Combination grinder, buffer, and polisher
3. Emery, bench or pedestal type
4. Face, with magnetic chuck
5. Portable tool post
6. Precision, for external and internal grinding
7. Universal tool cutter, drill and reamer grinder
8. Wet tool
HACK SAW — motor or belt driven
HAND PICKS — for cleaning inside of cupola. 1¼ to 2½ lb.
HARDNESS TESTING MACHINE
LATHES — belt or individual drives
1. Automatic
2. Bench, 6-in. to 11-in. swing, 11 in. to 36 in. between centers
3. Change gear, 9-in. to 14-in. swing, 18 in. to 36 in. between centers
4. Quick-change gear, 9-in. to 16-in. swing, 18 in. to 36 in. between centers
5. Semiquick-change gear, 9-in. to 18-in. swing, 18 in. to 42 in. between centers
6. Turret
7. Metal spinning
MILLING MACHINE
1. Plain, cone or motor-driven type
2. Universal, cone or motor-driven type
NIBBLING MACHINE
PIPE CUTTER
PLANER — belt or motor driven
POWER HAMMER — for forging operations
PUNCHES — metal, hand, or power
PYROMETER
PYROSCOPE
RELIEVING ATTACHMENT FOR LATHE
SAND SIFTER — for foundry, hand or power
SANDBLAST OUTFIT — with cabinet
SCALE
1. Counter for machine shop
2. Platform, for foundry, 1000-lb. capacity
SHAPER
SNAP-FLASK JACKETS — to fit snap flasks used
STRAIGHTENING PRESS
SURFACE PLATES
SWAGE BLOCK AND STAND — for forge shop
TAPER ATTACHMENT FOR LATHE
TRUCK — warehouse
TUMBLING BARREL — for foundry
VISES
1. Blacksmith
2. Drill press
3. Machinist
4. Pipe
5. Planer
6. Shaper
WELDING OUTFIT
1. Acetylene
2. Electric

Metalworking — Small Tools

ARBORS
1. Drill chuck to suit requirements
2. Reamers, various sizes
3. Shell tool, various sizes
4. Straight shank for shell reamers and shell drills, selected sizes
5. Taper shank for shell reamers and shell drills, selected sizes
BEARING SCRAPER
BELLOWS — for foundry class
BEVEL PROTRACTOR
BROOMS AND FLOOR BRUSHES — for shop and foundry
BRUSHES
1. Bench
2. Core box
3. Core painting
4. Hard brushes for foundry
5. Floor
6. Soft brushes for foundry
BULB SPONGES — for molders
CAKE FORKS — for foundry
CALIPERS
1. Hermaphrodite, 4 in. and 6 in.
2. Inside, 4 in. and 6 in.
3. Outside, 4 in. and 6 in.
CANS
1. Oil, ½ pt., 1 pt., and 10 gal.
2. Waste
CENTER TESTERS
CHISELS
1. Cape, 3/8 and 5/8 in.
2. Cold, 5/8 and ¾ in.
3. Diamond point, 3/8 and ½ in.
4. Roundnose, 3/8 and ½ in.
CLAMPS
1. 4, 6, 8, and 10 in.
2. Flask, for foundry
3. Strap, various sizes
COLLETS
1. For milling machine, selected sizes
2. For lathe, selected sizes
COMBINATION SQUARES — with hardened head and blade, and protractor head, 9 and 12 in.
COUNTERBORES — straight and tapered shanks, selected sizes
COUNTERSINKS — for metal
CRUCIBLE TONGS — to fit crucibles
CRUCIBLES — selected sizes
1. Shanks, single end to fit ladles
2. Shanks, hand, to fit ladles
CUTTERS — angular milling, bevel gear, concave milling, convex milling, end milling, face milling, formed milling, grooving, involute gear teeth, key seat, side milling, and metal splitting
DIVIDERS — spring, 4 and 6 in.
DRAW PINS — for molders
DRILLS
1. Drifts, different sizes
2. Sleeves, different sizes
3. Stand for Nos. 1 to 60
4. Stand for 1/16 to ½ in. by 64ths
DRILLS
1. Center
2. High speed, taper shank, various sizes
3. Jobbers, straight shank, 1/16 to ½ in. by 64ths
4. Ratchet
5. Straight shank, Nos. 1 to 60
6. Taper shank, ½ to 1 in. by 16ths
FILE CARDS
FILES
1. Die sinkers, various shapes
2. Flat bastard, 8, 10, 12, and 14 in.
3. Half round, double cut, 6, 8, 10, and 12 in.
4. Hand, smooth, 8, 10, and 12 in.
5. Mill, smooth, 8, 10, and 12 in.
6. Round bastard, 8 and 10 in.
7. Square bastard, 8 and 10 in.
8. Swiss, various shapes
9. Three-square, double cut, 6 in.
10. Warding, double cut, 6 in.
FIRST-AID CABINET AND SUPPLIES
FORGE TOOLS — drift pins, flatters, fullers, hand and handle punches, hardies, hot and cold cutters, set hammers, and swages for the forge shop
GATE STICKS — maple for foundry
GAUGES
1. Center
2. Depth
3. Drill and wire
4. Screw pitch, select kinds
5. Surface
6. Thickness
GLOVES — asbestos, for foundry
GOGGLES
1. For machine shop
2. For foundry
HACK SAW
1. Blades, hand, 18T, 10 in.
2. Blades, power, 14T, 12 in.

(Continued on next page)

(Continued from previous page)

3. Frames, adjustable

HAMMERS
1. Babbitt
2. Ball peen, 13, 16, or 20 oz.
3. Blacksmith's, various kinds
4. Riveting, 9 and 12 oz.
5. Setting

INDICATOR
1. Center
2. Universal or universal dial test
3. Speed

KNURLING TOOL — with assorted knurls

LADLES
1. Bull
2. Hand bowls
3. Melting

LATHE DOGS — ½, ¾, 1, 1½, 2, 2½, and 3 in.

LEGGINGS — fireproofed duck, to protect students when pouring in foundry

LEVEL — 6-in. bench

LIFTING SCREWS — for molders

MALLETS — wood or soft

MANDRELS — selected sizes

MICROMETERS — inside, 1½ to 8 in.; outside, 0 to 1 in.; outside, 1 to 2 in.; outside, 2 to 3 in.

MOLDING BOARDS

MOLDING STICKS AND TROWELS — various kinds

NIPPERS — end cutting, 5 in.

OIL STORAGE TANK — with pump

OILSTONES — medium and fine

PAILS — galvanized, 12-qt. capacity for foundry

PARALLELS
1. Adjustable
2. Steel, assorted sizes

PLIERS
1. Combination, 6 in.
2. Side-cutting, 6 in.

PUNCHES
1. Center, ¼ and ⅜ in.
2. Hollow, ½, ¾, and 1 in.
3. Pin, ⅛, 5/32, 3/16, 7/32, and ¼ in.
4. Prick, ¼ in.

RAMMERS — for foundry
1. Hand
2. Floor
3. Taper pin
4. With taper shank

REAMERS — various sizes
1. Adjustable
2. Hand

RIDDLES — ¼- and ⅛-in. mesh, 18-in. diameter, for foundry

RIVET SETS — assorted sizes

SCALES
1. Steel, 6 in., graduated 1/64 to ⅛ in.
2. Steel, 12 in., graduated to 32nds

SCREW DRIVER — 6 and 9 in. blade

SCRIBERS

SHOVELS
1. Coke
2. Sand

SNIPS — tin, 3 in. straight and 3 in. curved

SOCKETS — for taper shanks, drills and tools, selected sizes

SOLDERING COPPERS AND HANDLES — 1-lb. size

SPRAY CAN — for molders

SPRINKLING CANS — galvanized iron, 16-qt. capacity, for foundry

SPRUE PICKS — for molders

SQUARES
1. Machinist's, 6 in.
2. Blacksmith's

STEEL FIGURES — ⅛ in.

STEEL LETTERS — ⅛ in.

SWABS — for molders

TAPELINE — steel, 25 ft.

TAPS AND DIES
1. Machine screws
2. Pipe
3. N.F. ¼ to ¾ in.
4. N.C. ¼ to ¾ in.

TONGS
1. Blacksmith's, various kinds
2. Pick up, for foundry
3. Shake out, for foundry

TOOL HOLDERS
1. Boring tools
2. Cutting-off tools
3. Planer
4. R.H. and L.H. offset shank
5. Shaper
6. Slotter
7. Straight shank
8. Threading

TOOL HOLDER BITS — square, ¼, 5/16, ⅜, 7/16, and ½ in.

TRAMMEL POINTS

V BLOCKS AND CLAMPS

WHEEL DRESSER

WRENCHES
1. Adjustable, 8 and 10 in.
2. Pipe, 8 and 12 in.
3. Tape, adjustable, various sizes

Metalworking — Materials and Supplies

ABRASIVE CLOTH — aluminum oxide. Grits 320 to 24, obtainable in sheets or rolls

ABRASIVE WHEELS

ACETYLENE GAS — in drums for welding

ALUMINUM
1. Pigs for foundry
2. Sheets, tubing, rounds, shapes, wire, etc.

BABBITT METAL

BEARING BLUE

BELT DRESSING

BELT LACING MATERIAL

BELT LEATHER

BOLTS
1. Carriage, selected sizes
2. Lag, selected sizes
3. Machine, selected sizes
4. N.F., selected sizes
5. Stove, flat or roundheads, selected sizes

BRASS
1. Bars, 3/32, ⅛, 3/16, and ¼ in. thick; ⅜ to 1 in. wide, 8 to 10 ft. long, selected sizes

(Continued on page 50A)

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ELECTRIC SUPPLY & DISTRIBUTION FOR HIGH SCHOOL ELECTRIC SHOPS

You should have Publication No. 244 . . . *especially* if you are planning a new shop or re-vamping your present one. This booklet gives valuable suggestions; offers a shop layout plan and lists fundamental requirements.

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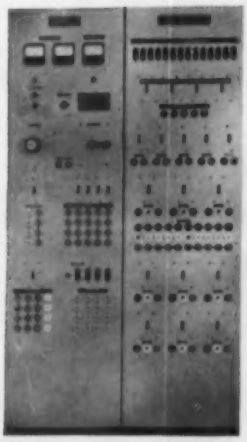
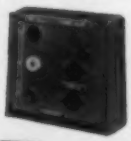


DISTRIBUTION SWITCHBOARD
This controls and distributes all the various a-c and d-c currents required for any work in the Electric Shop.



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Typical bench unit for 2- or 3-wire variable service, 120V a-c and continuity test circuit. Single or double faced. Many other types.

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Other types furnished to meet requirements.

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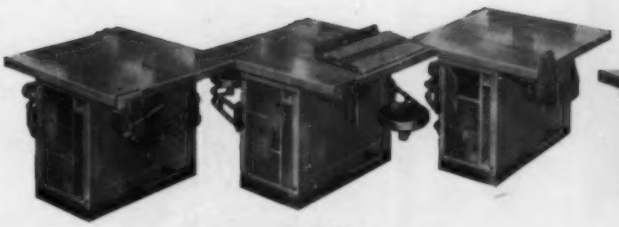

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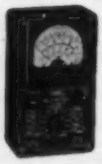

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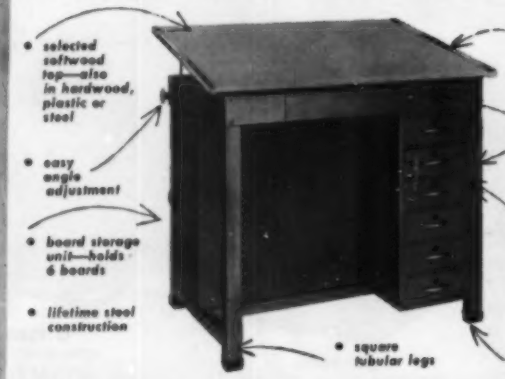
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(Continued from page 48A)

2. Round rods, 3/16 to ½ in. by 16ths, selected sizes
3. Sheets, 28 to 32 American gauge, 12 in. wide by 72 to 84 in. long, selected sizes
4. Strips, 1/32 and 1/16 in. thick, ½ to 1½ in. wide, 50 ft. to a coil, selected sizes
5. Threaded rods, Nos. 6 to 10, in 24 in. lengths, Nos. 12, 14, ¼, and 5/16 in., in 24 in. lengths, selected sizes
6. Wire, soft, 8, 11, and 14 American gauge, selected sizes
7. Wire, spring, 8 to 22 American gauge, selected sizes

CASEHARDENING COMPOUNDS
CHAPLETS — single and double head
COAL
1. Charcoal for foundry or forge
2. Coke for foundry
3. Forge

COPPER
1. Pigs, for casting alloys
2. Sheets, 8 to 25 American gauge, 30 by 60 in., selected sizes
3. Tubing, outside diameters, 3/16, ¼, 5/16, ⅜, and ½ in.; thickness of wall, 1/32 in.; lengths, 8 to 12 ft., selected sizes
4. Wire, soft, 2 to 20 American gauge, in coils. Also in ¼, ½, and 1 lb. spools, sizes 16 to 36, English gauge, selected sizes

CORE
1. Compounds
2. Flour
3. Paste
4. Oil
5. Wax-vent wire

CUTTING COMPOUNDS
FIREBRICKS AND CLAY — for foundry
FIRE HANDLES — assorted sizes
GRAPHITE — for foundry
IRON — pig, for foundry
LACQUER — transparent and colored, for finishing
NUTS — S.A.A., acorn cap, castellated, square, hexagon, joint, and wing, selected sizes and kinds
OIL
1. Boiled linseed
2. Lubricating
3. Quenching and hardening

PACKING
Round, sheet, square, or tubular
PAINT — black asphaltum
PINS
1. Cotter, 3/32 to ¼-in. diam. from ½ to 2 in. long
2. Flask, for flask repairs
3. Taper, Nos. 0 to 6, ¾ to 2 in. long

PUMICE POWDER
RIVETS
1. Copper, with burrs, Nos. 7 to 14, lengths, ⅛ to ¾ in., selected sizes
2. Iron, No. 14 gauge to 3/16 in., flathead or button head, ¼ to 1 in. long, selected sizes
3. Tinners', flathead, 8 oz. to 16 lb., either tinned or black, selected sizes

SAND
1. Molding in 350-lb. barrels or 800-lb. casks
2. Parting, in 350-lb. barrels or 800-lb. casks

SCREWS
1. F.H. or R.H. iron or brass, selected sizes and kinds
2. Cap and machine, iron or brass, selected sizes and kinds
3. Set, head and headless

SOLDER — acid or rosin core; bar, or solid wire
SOLDERING PASTE OR SALTS
STEEL
1. Bessemer, rod, 1/64 to ⅜ in. by 64ths, in 4-ft. lengths, selected sizes
2. Bars, cold rolled, ⅛ to ⅜ in. thick, ½ to 2 in. wide, 12-ft. lengths, selected sizes
3. Drill rod, letter sizes, A to Z, number sizes, 1 to 80, in 3-ft. lengths, selected sizes

(Continued on page 52A)

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VISUALIZE . . . the problems they will encounter

DEMONSTRATE . . . how these problems can be solved

EMPHASIZE . . . the correct procedures to be used

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(Continued from page 50A)

4. Rods, hexagon and square, cold rolled, ¼ to ¾ in., in 12-ft. lengths, selected sizes
5. Round, cold rolled, diameters ⅛ to 1 in., lengths 12 ft., selected sizes
6. Sheet, black, Nos. 18, 20, 22, 24, 26, 28, U. S. gauge; size of sheets, 24, 28, and 30 in. by 96 in.
7. Sheet, galvanized, Nos. 18, 20, 22, 24, 26, 27, and 28, U. S. gauge; size of sheets, 24, 28, and 30 in. by 96 in., selected sizes
8. Threaded rods, Nos. 6 to 10, in 12-in. lengths, Nos. 12, 14, ¼ in., and 5/16 in., in 24-in. lengths, selected sizes

TIN

1. Pigs, for casting alloys
2. 1C, 1X, 20 by 48 in.
3. 1XX, 20 by 48 in.

WASHERS AND BURRS

1. Copper burrs, Nos. 3 to 14, in 1-lb. boxes
2. Iron burrs, Nos. 3 to 14 in 1-lb. boxes
3. Brass washers, 3/16 to ½ in. by 16ths
4. Iron washers, 3/16 to ½ in. by 16ths

WELDING FLUXES

WELDING RODS (all rods come in 24-in. lengths)

1. Brazing, 1/16, ⅛, 3/16-in. diameter.
2. Cast aluminum 3/16, ¼, and ⅜-in. diameter
3. Cast brass, 3/16 and ⅜-in. diameter
4. Cast bronze, ¼-in. diameter.
5. Cast copper, 3/16 and ¼-in. diameter
6. Cast iron, 3/16, ¼, 5/16, and ⅜-in. diameter
7. Low carbon steel, ⅛, 3/16, and ¼-in. diameter

WHITE LEAD — for machine shop

WIRE

1. Annealed, 16 to 34 W and M gauge, selected sizes
2. Coppered market, 5 to 18 W and M gauge, selected sizes
3. Coppered spring, 2 to 18 W and M gauge, selected sizes
4. Galvanized, 5 to 18 W and M gauge, selected sizes
5. Piano, Nos. 2/0 to 36, selected sizes
6. Tinned, 16 to 24 W and M gauge, selected sizes
7. Wool, Nos. 0 to 3 in 1-lb. packages, selected sizes

ZINC

1. Pigs, for casting alloys
2. Sheet, Nos. 4 to 14, sheets 36 by 84 in.

PERSONAL NEWS

(Continued from page 46A)

N. Y., and a daughter, Mrs. Lee Harder of Wellsville, N. Y., and a sister, Miss Mae Park of Horseheads, N. Y.

WADSOR MARTIN SCOVILLE DIES

Wadsor Martin Scoville, 69, a retired member of the faculty of State University of New York teachers College, Oswego, died Saturday, January 5, 1957.

Mr. Scoville was a graduate of Mechanics Institute, Rochester, which is now known as Rochester Institute of Technology. He then came to Oswego and was graduated at the former Normal school. Later he obtained his bachelor of science and master of science degrees at Syracuse University. He was also a registered architect.

For 32 years he was a member of the faculty of Oswego State Teachers College and its predecessor, Oswego Normal School. He joined the faculty about 1918 and served in the industrial-arts department until retiring in 1950 due to failing health. One of the best known members of the faculty, he was an instructor in mechanical drawing and photography and industrial-arts design.

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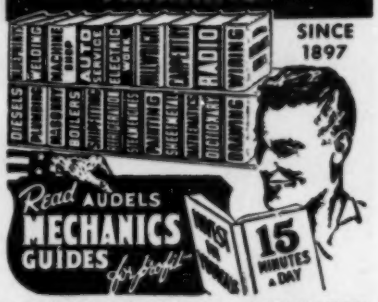

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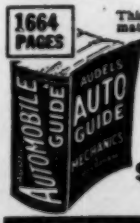

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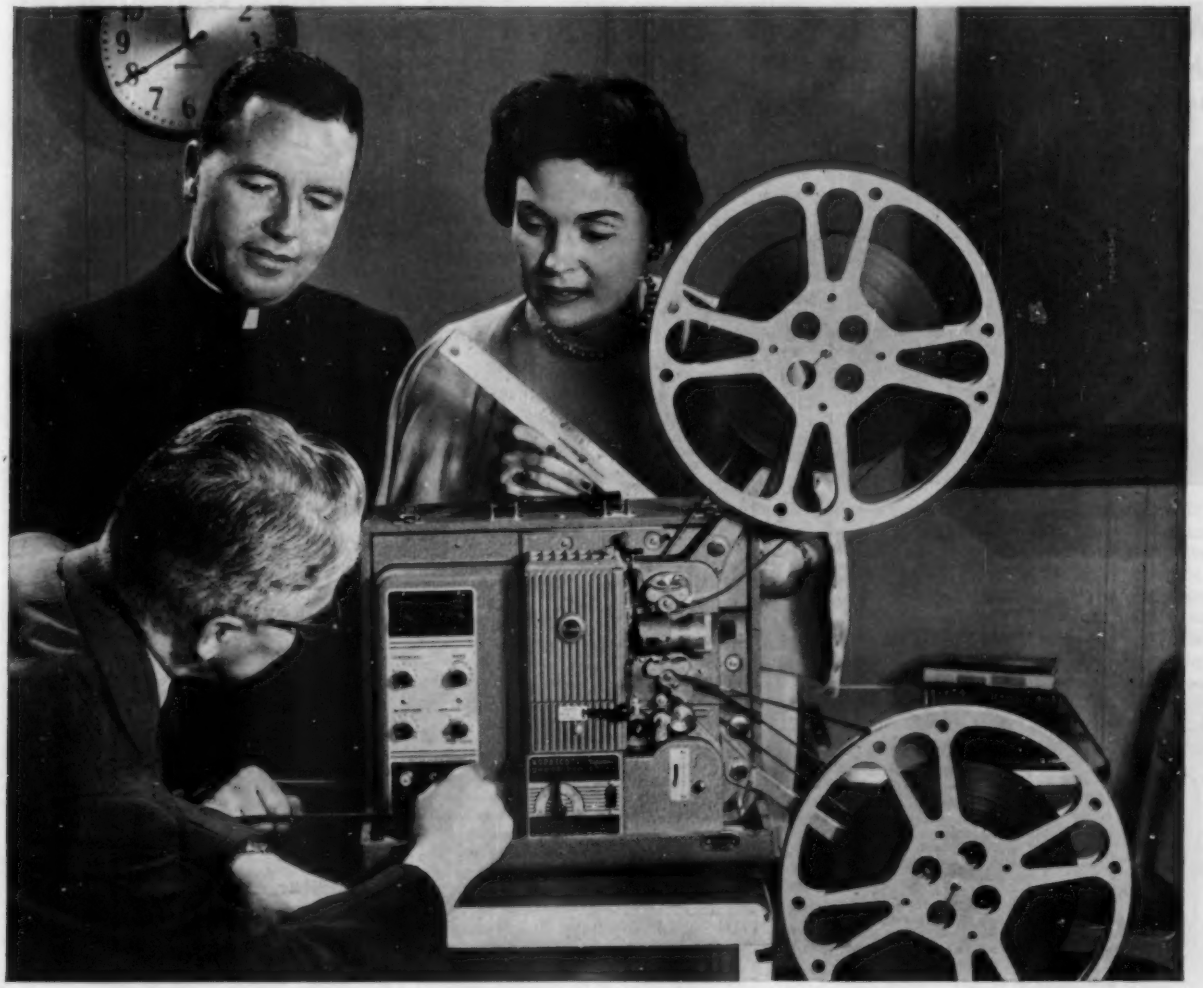
Occupation _____

Employed by _____ IA 3



...now let's pick the right 16mm sound projector

Educational leaders who know the value of films as a teaching tool know, too, how important the right projector is.

Here are some of the questions they ask—and answers that can help *you* make a wise choice.

1. Is it easy to set up? You'll want a machine that can be handled confidently by many people, including inexperienced operators. Try the Kodascope Pageant 16mm Sound Projector. Hinged reel arms, with attached drive belts, fold quickly into place. Even a novice can follow the threading path, printed on the machine. This makes for smooth, sure starts . . . every time.

2. Are the pictures bright and sharp? You don't have to be satisfied with washed-out pictures, even in hard-to-darken rooms. The Pageant's special Super-40 Shutter puts 40% more light on the screen at sound speed than ordinary shutters. You get sharp images, full of sparkle and important detail . . . the kind of pictures that catch and hold attention on the screen.

3. Can it use the full range of sound on the track? Sound-track sound, not projector noise, is what you want. And you get just that from a Pageant because you have a complete sound *system*—true-rated amplifier, well-baffled speaker, and separate base and treble controls. And the Pageant's nylon gears give you whisper-quiet operation.

4. Is it always ready when and where wanted? Pageants are *lubricated for life*. This ends the most common cause of breakdown and keeps maintenance to a minimum. And a Pageant is easily *portable*—ready for use anywhere, at a moment's notice.

For a complete demonstration of how a Pageant can help you make the most of every showing, visit a nearby Kodak Audio-Visual dealer. Or write us for details. No obligation, either way.

P.S. With the addition of Kodak's exclusive Bi-Focal Lens Converter, any Pageant can be used in a small or large room and still provide the right-sized screen image.

EASTMAN KODAK COMPANY Dept. 8-V Rochester 4, N. Y. 3-193

Please send me complete information on the new Kodascope PAGEANT 16mm Sound Projectors and tell me who can give me a demonstration. I understand I am under no obligation.

NAME_____ TITLE_____

ORGANIZATION_____

STREET_____

CITY_____ STATE_____ (Zone)

Kodak TRADE MARK

IRWIN Wood-Boring Tools

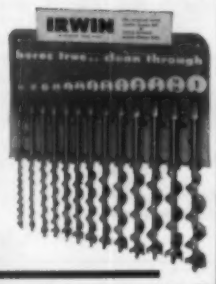
help get school shop projects done on time

The faster, cleaner, always accurate boring action of Irwin wood boring tools saves time and materials, steps up class room efficiency. Projects get done on time. The quality of the finished job stimulates student interest and appreciation of good workmanship. And replacement costs are lower, too. Irwin wood-boring tools are made to last much longer. Put Irwin to work in your shop and see. Order from your school shop jobber or independent hardware dealer.

IRWIN SPEEDBOR "88"
New spade type electric drill. Does more work with less power — steps up the efficiency of small ¼" electric drills and drill presses. Exclusive hollow ground point bores cleaner, faster in hard and soft woods, plywood, plaster, plastics. No wobble or run off. Size markings on head. Hang-A-Bit hole for storing on nail or pin. Sizes ¼" to 1", open stock or sets.

62T BORCHEST SET
America's most popular School Shop set. 13 Irwin 62T hand brace type bits in hand-rubbed hardwood box, sizes ½" to 1". Medium fast screw pitch makes the Irwin 62T ideal for all-purpose boring in most any wood. Double cutter action, solid center design, hardened full length for longer life. Each bit highly polished. Also available in individual sizes and plastic roll sets.

D-13 SCHOOL SHOP SPECIAL
Irwin storage rack and bit set. A convenient combination of 13 Irwin 62T wood auger bits and small space storage rack. Patented spring steel clips hold bits in place. Hole sizes make selection sure and easy. Steel rack fits 8" x 10¼" area and screws easily to wall or bench. Boring range of 13 bits, ¼" to 1". Write for Free Irwin Catalog No. 52. Makes ideal reference guide.



IRWIN Wilmington, Ohio
the original solid center auger bit
•
screw drivers
screw driver bits

AUTOMOTIVE EQUIPMENT

(Continued from page 44A)

3. Resistance wire, chromel No. 27, 3.25 ohms per ft.
4. Bonding wire, annealed iron, stove pipe No. 16

Hand Tools

Numerous hand tools are needed in an auto shop since this is a service trade. Tools should be the type used currently in the trade and should be sturdy, simple and practical. In purchasing tools, particular attention should be given to the alloy content, heat treatment, and guarantee.

CALIPERS
1. 6" — inside spring nut release, screw thread adjustment. High grade spring steel
2. 6" — O.D. spring nut release, screw thread adjustment. High grade spring steel

CARBURETOR TOOL KIT
Complete set of overhaul tools for popular makes of carburetors

CHISELS
1. Cape ¼" — 6" length forged tool steel
2. Cold ½" — 6" length forged tool steel
3. Diamond point ¼" — 6" length forged tool steel

DIES (for economy, purchase taps and die in sets)
1. Machine screw — 6–32NC, 6–40 NF, 8–32NC, 8–36NF, 10–24NC, 10–32NF, 12–24NC, 12–28NF
2. National standard — adjustable round split dies forming American standard thread 7/16" thickness, 1 5/16" outside dia. high quality alloy: ¼"–20NC, 5/16"–18NC, ⅜"–16NC, 7/16"–14NC, ½"–13NC, 9/16"–12NC, ⅝"–11NC, ¾"–10NC, ¼"–28NF, 5/16"–24NF, ⅜"–24NF, 7/16"–20NF, ½"–20NF, 9/16"–18NF, ⅝"–18NF, ¾"–16NF
3. Die stock machine screw — to hold 13/16" O.D. round adjustable machine screw die
4. Die stock, national standard — to hold 7/16" thick, 1 5/16" O.D. national standard die

DIVIDERS
6" stiff spring tapered spool, high quality spring steel legs with replaceable needle-points

DRILL STAND — fractional 1/16" to ½"

DRILL, ELECTRIC (*see* Special Equipment Section)

FILE CARD
Steel back frame and face. Tempered steel wire bristles, complete with steel tapered pick

FLARING TOOL
3/16" to ⅝" O.D. tubing size

GAUGES
1. Shoe and drum gauge — leaf type shim gauge for testing brake shoe and drum clearances
2. Tire gauge, standard tire pressure gauge, 0–60 lb. capacity
3. Screw pitch gauge, 60°V type thread, 22 pitches, 32 to 74
4. Thickness gauge, 2 5/16" length blade, 22 blades .004" to .025" tempered and encased
5. Thickness gauge, 6" blade, 8 tapered leaves, .002, .003, .004, .006, .008, .010, .012, and .015 leaves

HAMMERS
1. Machinist — 12 oz. ball peen, forged steel, heat treated and polished, wooden handle
2. Machinist — 24 oz. ball peen, forged steel, heat treated, wooden handle
3. Claw hammer, adze eye, curved claw, bell shaped head. Wooden handle, forged head

a School Shop "must"

HOSSFELD

UNIVERSAL® IRON BENDER

Bends Flats, Rounds, Bar, Angle & Pipe

Model #1 — WRENCHLESS TYPE

SAMPLES OF BAR BENDING

Simulate in the shop the 101 different bending jobs your students will be called on to perform in repair, maintenance and production work. Teach them to make neat, quick and accurate round or square cold bends on pipe, conduit and ornamental iron work. Make them proficient in forming "U" bends, eye bolts, angle iron, automobile springs eyes, heavy bends, sharp square and 90° bends, and a host of others. The Hossfeld Bender has been proved over the years in metal-working, welding and repair shops. It replaces special machinery, and is as practical and indispensable as a shop vise.

GET THE FACTS!
Write today for bulletin giving operating instructions, specifications and capacities of the models available, and die and parts list.

HOSSFELD
MFG. CO.
438 W. 3rd Street
Winona, Minnesota

4. Sledge — 7 lb. bell face, adze eye, forged hardened and tempered steel. Wooden handle
5. Soft faced head, wooden handle

KNIFE, PUTTY
1¼" wide 3½" long, tempered polished elastic steel

MICROMETERS
1. Inside diameter — calibrated to .001", range 2"–9½", calibrated thimble with ground steel extension rods. Angular grooved extensions for quick adjustment
2. Outside diameter — drop forged "I" section frame. Anvil, spindle, and barrel high quality, ground steel. Standard calibrations. Size 0–1", 1–2", 2–3", 3–4" (4 sizes)

OILER
5 oz., 3" spout, steel can, tempered steel bottom

OIL STONE
4" x 1¾" x ½" medium, complete in wooden case

OIL MEASURE
2 qt. heavy gauge galvanized steel combination measure, funnel and spout. All seams soldered

PISTON RING INSERTER SET
Spring steel strap type with a "T" handle adjusting device

PLIERS
1. 5" — flat nose, cross-checked, spring tempered nose, forged tool steel
2. 7" — long tapered flat nose, cap joint forged, tempered crestalog steel or equal
3. 8" — combination slip joint, forged tool steel
4. 7" — diagonal cutter mechanic's pliers, forged heat treated high grade tool steel

PUNCHES
1. Drive pin, 8" knurled hardened steel, set of 8: 1/16" dia. to 5/16" dia.
2. Center, ¼" x 4", forged alloy steel hammer tested, knurled handle

RIVET SET
Hand type for button head rivets

RULE, STEEL
12" x 1" width stainless steel, tempered, graduated in 1/8", 1/16", 1/32", 1/64"

SAW, HAND HACK
8" — 12" adjustable frame, 2¾" throat, pistol grip

SCREW DRIVERS
1. 3" — carbon steel blade, wooden handle pinned to blade
2. 6" — carbon steel blade, 5/16" dia. wooden handle pinned to blade
3. 9½" — square drop forged steel blade, perfect handle grip riveted to blade
4. 6" — carbon steel blade, 3/16" dia. tough plastic molded handle
5. Offset at both ends, forged and tempered tool steel, set of 6 for 3/16" to ¾"
6. Phillips head screw driver, alloy steel tempered deep fluted blade. Set of 4 to fit points Nos. 1, 2, 3, and 4
7. Clutch head screw driver, alloy steel tempered. Set of 4, Nos. 1, 2, 3, and 4

SCREW EXTRACTOR
Straight shank, deep fluted blade, hardened tool steel, set of six

SCRIBER
1/8" dia. 10" double point hardened tool steel

SNIPS, TIN
1. Straight — 3" drop-forged hardened tool steel, straight blade ground and polished
2. Curved — 3" drop-forged, hardened tool steel

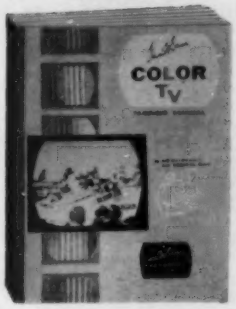
SOLDERING IRON, ELECTRIC
5/8" electric soldering copper, 200 watt complete with cord, tip and stand

SQUARE, COMBINATION
Tempered 12" blade with forged square, center, protractor heads

STAMPS, STEEL
1. 3/16" hand cut figures 1 to 0

(Continued on page 58A)

NOW you can add COLOR TV to your courses of instruction



THE COMPREHENSIVE COURSE ON COLOR TV

only $6.95

ORDER BELOW

THIS BOOK IS YOUR IDEAL TEACHING GUIDE FOR EFFECTIVE COLOR TV TRAINING

"COLOR TV TRAINING MANUAL"

This comprehensive training course, written by Oliphant and Ray, clearly covers the entire subject of Color TV. Contents: **SECTION I:** Principles of the Color TV System (includes chapters on Colorimetry; Requirements of the Composite Signal; Make-up of the Color Picture Signal). **SECTION II:** Color Receiver Circuits (chapters on RF and IF Circuits; Video, Sync and Voltage Supply Circuits; Bandpass-Amplifier, Color-Sync and Color-Killer Circuits; Color Demodulation; Matrix and Output Circuits). **SECTION III:** Servicing the Color Receiver (chapters on Setting Up the Color Picture Tube; Aligning the Color Receiver; Trouble-Shooting; Test Equipment Required). Appendices include Equations, Vectors, Color-blocks, Colorplates, Glossary. A well-organized, effectively presented training course for advanced students in Electronics. 260 pages, 8½ x 11"; profusely illustrated. Order **TVC-1**, only..... **$6.95**

USE THESE LEADING TRAINING COURSES

RELY ON THE WIDELY USED

SAMS BASIC MANUALS

"BASIC TELEVISION MANUAL." Here is the most comprehensive and valuable training course for instruction in Television. Organized as follows: **LESSON SECTION:** 24 lessons covering such subjects as Oscilloscope principles and application; power supplies; FM carrier waves, discriminators, ratio detectors; antenna principles and design; TV receivers; RF amplifiers and tuners; Video IF, detection and AGC; cathode ray picture tubes; sweep circuits, and other subjects. **PROJECT SECTION:** Describes 9 basic projects which demonstrate theory in action; they teach through actual, practical doing. 308 pages; illustrated; 8½ x 11". Order **ED-21**, only..... **$5.00**

"BASIC RADIO MANUAL." The widely used Training Course in Radio. Includes 36-Lesson Section covering basic radio theory, terms, circuits and symbols, components, test instruments, radio transmitting and receiving principles, etc. The 13-Project Section demonstrates theory in practical action by actual doing; includes construction projects, application of basic laws, soldering practice, construction, etc. Adopted as standard text by hundreds of schools. 248 pages; fully illustrated. 8½ x 11". Order **ED-1**, only..... **$5.00**

"BASIC ELECTRICITY MANUAL." This outstanding training course consists of 35 Lessons in Practical Electricity, covering basic theory, laws, terms, magnetism, motors, transformers, lighting, telephones and dozens of other subjects. Includes 13-Projects Section, outlining simple, inexpensive projects which demonstrate theory in practical action and which teach interestingly through actual doing. 264 pages; profusely illustrated; 8½ x 11". Order **ED-12**, only..... **$5.00**

FREE **TRAINING AIDS FOR INSTRUCTORS:** Write for our FREE "Planning Guide for Instructors" and Wall-Size TV and Radio Schematics—invaluable aids to instruction in Radio, TV, Electronics and Electricity.

order from **HOWARD W. SAMS & CO., INC.,** Indianapolis 5, Indiana

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HOWARD W. SAMS & CO., INC., 2216 E. 46th St., Indianapolis 5, Ind.

Send me the following (with 30 day return privilege):

☐ copies "Color TV Manual" ($6.95) ☐ copies "Basic Radio" ($5.00)
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☐ Send FREE Instructors' Aids

Name_____ Title_____

School_____

Address_____

City_____ Zone____ State_____

picked by professionals

Reach for a Venus drawing pencil and get the sharper, clearer line (in all 17 degrees of hardness) your work demands. Venus homogenized lead holds a needle point longer, insures uniform smoothness, perfect smudge-free work. Pressure proofing seals the lead to the wood along its full length so the Venus is stronger. Prove Venus superiority for yourself. *Send for the educational brochure "Atomic Energy and You" and get a FREE Venus Drawing Pencil.*

VENUS® drawing pencils

VENUS PEN & PENCIL CORPORATION, HOBOKEN, N. J.

Drafting — Small Equipment and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films and silent or sound movies may be used by the students in the industrial arts and vocational education courses.

ADJUSTABLE-CURVE RULER
BEAM COMPASS
BENCH BRUSHES
BLUEPRINT
1. Frame or machine
2. Washing trays or washer
3. Paper tube, airtight
4. Drying rack or dryer
BOOKCASE
CABINET
1. For filing drawings
2. For storing drawing boards
3. For storing drawing instruments
4. For storing models
CALIPERS — 6 and 8 in., inside and outside
CHAIR — teacher's
CHALKBOARD
1. Permanent or portable
2. Compass, 15 in., with locking device
3. Drawing set, T-square, straightedge, triangle, and protractor
DESK — teacher's
DIVIDERS — proportional
DRAFTING MACHINE — and accessories
DRAFTSMAN'S STEEL PROTRACTOR
DRAWING BOARDS — large
DRAWING-BOARD SUPPORTS — to be set on or attached to woodworker's bench
DRAWING TABLES AND STOOLS
1. For students
2. For teachers
INK-BOTTLE HOLDER
IRREGULAR CURVES — Nos. 17, 21, and 24, wood, or transparent
LETTERING ANGLES
LETTERING PENS — assortment of 12
LEVEL OR TRANSIT — builders' for architectural students
LEVELING ROD — for use with the transit
MACHINISTS' COMBINATION SET — 12 in.
MARKING PINS — for use with measuring tape, for architectural students
MICROMETER — 1 in., for mechanical-drafting students
OILSTONE — 3-in. case
PANTOGRAPH — 21 in.
PARALLEL RULES
PLANIMETER
PLUMB BOB
SHEARS — for trimming blueprints and drawings
SPEED COUNTER — for mechanical-drafting students
STEEL SCALES — 12 in.
STOP WATCH — for mechanical-drafting students
TABLE
1. For cutting and trimming drawings and blueprints
2. For disassembling and re-assembling machine parts and models
TAPELINE
1. 100 ft., steel, for architectural students
2. 50 ft., steel or metallic
TOOLBOX — containing 1 machinists' hammer, one 6-in. adjustable wrench, one 6-in. screw driver, one 6-in. combination pliers
TRIANGLES
1. 30–60 deg., 14 in. transparent
2. 45 deg., 10 in. transparent
TRIANGULAR SCALES — civil engineers' type, 12 in.
T SQUARE — adjustable or fixed head, for large drawing board or straightedge with parallel rule attachment for large drawing board
WALL CHARTS — lettering, decimal equivalents, etc.
YARDSTICK

To be provided by, or for, each student

Drafting Supplies

DRAWING BOARD — size to be specified by instructor
DRAWING INSTRUMENTS — as specified by instructor
ERASING SHIELD
IRREGULAR CURVE — Nos. 8 and 13, transparent
PENCIL COMPASS
PENHOLDER — for lettering pens
PENS — assorted, for lettering
PROTRACTOR — not over 5 in.
SCALE — 12 in. architect's, triangular
SCALE GUARD
SLIDE RULE — as specified by instructor
T SQUARE — to fit drawing board
TRIANGLES — 30–60 deg., 10 in. transparent, and 45 deg., 8 in. transparent

Drafting Equipment

BICHROMATE OF POTASH — crystals
BLUEPRINT
1. Paper, 36 in. wide
2. Writing fluid
PAPER
1. Cross section, 8½ by 11 in.
2. Detail, 24 by 36 in.
3. Drawing, 24 by 36 in.
4. Isometric, 7 by 10 in.
5. Tracing, 36 in.
POWDER — for tracing cloth
TRACING CLOTH — 36 in.
VAN DYKE
1. Fixing salts
2. Paper, 36 in.
3. Writing fluid

Drafting — Additional Supplies

To be provided by, or for, each student.

ERASERS
1. Cleaning
2. Ink
3. Pencil
INK
1. Black, waterproof
2. Colored, if required
PENCILS — DRAWING, HB, 2H, 3H, 4H, and 6H
PENCIL POINTER PAD
THUMBTACKS OR SCOTCH TAPE

get your copy... This fully illustrated catalog was specially prepared for Industrial Arts Teachers. You will find in it just the kind of drafting tools and materials you need for *all* your mechanical drawing classes. *K & E quality and at prices within your budget!* That's why it will pay you to see this catalog before you buy *anything!* If you haven't had yours, write Keuffel & Esser Co., Hoboken, New Jersey.

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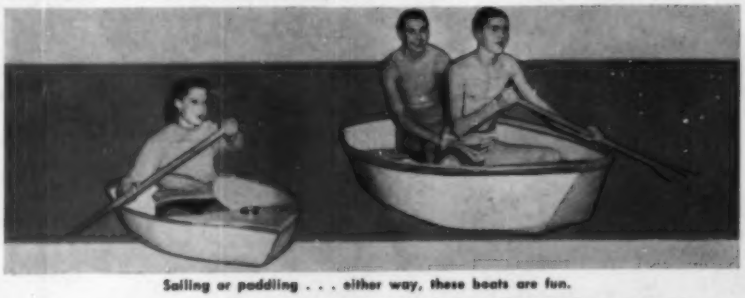
CASTOGLAS PROJECT OF THE MONTH



Sailing or paddling . . . either way, these boats are fun.

NOW YOUR STUDENTS CAN BUILD THEIR OWN FIBERGLASS BOATS

The new Castolite-Method of boat molding with fiberglass-reinforced Castoglas teaches students the basic principle of fiberglass laminating. Simplicity of design, easy-to-follow illustrated directions and the fact that only small hand tools are needed make this boat building program an ideal project for every wood or metal shop.

No heat or pressure is required. The one-piece, seamless hull is leakproof and will not rot, rust or corrode. It is practically maintenance-free for its entire long life.

The two boats featured here were built from the same design. The 6-foot (5'-9") sailboat has a 31 inch beam, depth of 9 in. and weighs 16 lbs. Dinghy is 8'-3", 48 in. beam and 14 in. deep, weighs 45 lbs. and carries 3 adults comfortably. Heavy-duty transom will support outboard motor.

The Casto-Craft boat kits contain the molds and needed glass fabric, Castoglas, color and detailed photographic instructions. Sail and mast are not included, nor the wood for benches and gunwales for the 8-ft. boat because you may want to design and install your own special features. Price of 6-ft. sailboat kit is $39.50; 8 footer is $79.50 — F.O.B., Woodstock, Ill. For more information, ask for special Casto-Craft Fiberglass Boat folder. Write to:

School Dept. C-50

Hoisting the sail. The feather-weight hull just glides through the water, even in the softest breeze. Weighs only 16 lbs. but is much stronger than wood boat twice its weight. Load capacity of 150 lbs., it was designed for small lakes for youngsters from 8 to 14.

THE CASTOLITE COMPANY

Woodstock, Illinois

● **Producers and Distributors of Casting, Laminating, Coating and Molding Resins.**

Serving Industry Science, the Arts and Crafts.

Some hull design was used for both boats. Except for size, they are identical.

The 8 foot dinghy is also a fine fishing boat for two or three.

Clean as enamel, easy to carry and stors away. Weighs 45 lbs.

Laying fiberglass cloth and impregnating with a coat of white Castoglas.

The boat builders (12 to 14 year old Junior High boys) are cutting glass cloth.

Laminating several layers of glass cloth for the two decks of the sailboat.

NEWS NOTES

(Continued from page 35A)

♦ The Westinghouse Broadcasting Company, Inc., which recently became the first commercial broadcaster to purchase the entire Encyclopaedia Britannica Films Library for use on its television stations, is making selections from that library of 650 films available free to educational stations within the service areas of the Westinghouse stations.

The Encyclopaedia Britannica Films, which have been used in schools and universities throughout the world and have been hailed by educators, will be made available to educational broadcasters through the Westinghouse stations in their communities: KQED, San Francisco, through WBC station KPIX; to WQED, Pittsburgh, through KDKA-TV; and to WGBH-TV, Boston, through WBZ-TV.

AUTOMOTIVE EQUIPMENT

(Continued from page 55A)

2. 3/16" hand cut letters A to Z

TAPS (for economy purchase taps and dies in sets)

1. Machine screw taps — hand tap, plug type, straight fluted, high quality, carbon steel fine ground thread; 1-set: 6–32NC, 6–40NF, 8–32NC, 8–36NF, 10–24NC, 10–32NF, 12–24NC, 12–28NF
2. N.C. Standard — hand tap plug type, national course standard thread, high quality carbon heat treated steel, 1-set: 1/4"–20, 5/16"–18, 3/8"–16, 7/16"–14, 1/2"–13, 9/16"–12
3. National fine standard, hand tap, plug type high quality carbon heat treated steel, 1-set: 1/4"–28, 5/16"–24, 3/8"–24, 7/16"–20, 1/2"–20, 9/16"–18, 5/8"–18, 3/4"–16
4. National Standard Pipe, 1/8", 1/4", 3/8"

TAP WRENCH

1. T-handle, single handle, adjustable chuck, hardened jaws, made of quality steel
2. Machine screw tap wrench, T-handle adjustable vise jaw, for holding machine screw tap size 6–32 to 12–28, quality steel
3. National Standard tap wrench, adjustable vise jaw, for holding tap sizes 1/4" to 3/4", high quality steel

WRENCH, ADJUSTABLE

6" — single and adjustable jaw, forged steel, replaceable parts

WRENCH, MONKEY

10" length, 2" capacity, forged jaws and handle with nonmetallic fitted handle

WRENCH, PIPE

10" — length, 1/8" to 1" pipe capacity, forged and hardened tool steel

WRENCH, SPANNER

Adjustable hook drop forged carbon steel hardened and finished smooth. Set of 3, capacity 3/4" to 4 3/4" diameter

It is recommended that only high quality alloy steel wrenches and sockets be purchased. Specifically, they should have lifetime guarantees so that cracked sockets and sprung wrenches can be replaced free of charge

WRENCHES, BOX

Double broached hex, double offset drop forged chrome-moly alloy steel. Lifetime guarantee and replaceable. 4 to 8 sets: 4 1/2" to 6" (short length), 3/16" and 1/4", 1/4" and 5/16", 5/16" and 3/8", 3/8" and 7/16". 8" to 19" (long length), 1/4" and 5/16", 5/16" and 3/8", 7/16" and 1/2", 9/16" and 5/8", 5/8" and 11/16", 3/4" and 7/8", 15/16" and 1"

(Continued on page 61A)

Economy, Simplicity and Dependability

FOR RECORD REPRODUCTION, SHOP AND DRAFTING INSTRUCTION

P & H WHITEPRINTERS in sizes and speeds for every need and budget

APPROVED and USED BY SCHOOLS EVERYWHERE

SpeedMaster Complete Whiteprinters

Design of the SPEEDMASTER is ideally suited for teaching, making transcripts of school records, and doing a variety of duplicating. In this compact dry-process whiteprinter, you have the same time-saving, cost-saving efficiency that has made these machines the choice of industry as well.

With the SPEEDMASTER, anyone can quickly make exact, same-size black-line and colored-line whiteprints of tracings, sketches, charts, forms, reports, or of any translucent original whether written, typed, or printed.

SPEEDMASTER features synchronized printing and developing speed, with full stop and reverse control. The P&H electronic drive provides instant and continuously variable speed changes. Handles cut sheets or roll stock up to 44" wide. Size: 60"x20"x62" high plus 14" removable feedboard.

SpeedMaster 1400C. 1500 watt, 14 ft. per min., 115 volt.$1395

Model 1400CT. Table Type.....$1295

SpeedMaster 2500C. 2750 watt, 25 ft. per min., 230 volt.$2095

SppedMaster 4000C. 4000 watt, 40 ft. per min., 230 volt.$2495

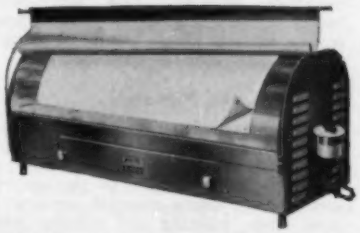
CopyMaster Office-Size Whiteprinters

Used in office and shop, and for instruction. Handles cut sheets or roll stock up to 20" wide. Synchronized printing and developing speed up to 30 ft. per minute.

CopyMaster Table Model 1400T. 115 volt.....$1195

CopyMaster Floor Model 1400F. 115 volt.....$1295

Spee-Dee Whiteprinter Outfits



For Economy in General Copying and Technique Instruction

Simplest and most inexpensive of all print making equipment. Makes exact duplicates of anything drawn, typed, printed or written—direct from a one-sided translucent original in as little as one minute at less than 2¢ a square foot. Uses either the semi-dry or the dry process. Automatic timer makes the Spee-Dee easy for anyone to operate without previous experience. Easily portable, works anywhere, just plug into 115 volt 60 cycle A.C. outlet. *Proved in over 10 years of use by schools and universities.* 12" x 18", 18" x 24" and 24" x 36" models. Prices start at $79.50.

FOR YOUR PHOTO LAB AND DARKROOM

Peck & Harvey equipment includes a complete line of custom-built Stainless Steel Sinks, Tanks and Trays specially engineered and quickly produced at stock-unit prices. Free darkroom layout service.

SEND FOR FREE LITERATURE ON P&H EQUIPMENT

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5649 N. WESTERN AVE., CHICAGO 45
Progressing with the Reproduction Industry Since 1937
MFRS. OF WHITEPRINT, BLUEPRINT & PHOTOCOPY EQUIPMENT

New Publications

Introductory Electrical Engineering

By George F. Corcoran and Henry R. Reed. Cloth, 527 pp., 6¼ by 9¼ in., illus., $7.95. John Wiley & Sons, Inc., New York, N. Y.

This book is based on a book written by Corcoran (published by Wiley in 1949) titled "Corcoran's Basic Electrical Engineering."

The material in it is so arranged that it can be used for short or comprehensive courses.

Besides its clear explanations and excellent illustrations, the book contains more than 400 graded problems for the student to solve.

Elements of Radio

By Charles I. Hellman. Cloth, 354 pp., 6¼ by 9⅛ in., illus., $3.96. D. Van Nostrand Co. Inc., New York, N. Y.

This is the third edition of this book. It is carefully prepared to give students a complete understanding of radio and television.

The 20 chapters present a study of the general problem of radio communication, a review of electrical theory, alternating current, properties of inductance and capacitance, resonance, thermal emission and the diode, the triode and the multigrid tubes, application of triode application, oscillators, radio transmitters, radio telephone transmitters, antennas, detection of radio waves, radio receivers, power supplies, cathode ray oscillations, some application of electronics, transistors, and television.

Cabinetmaking and Millwork

By Alf Dahl and J. Douglas Wilson. Cloth, 352 pp., 5¾ by 8½ in., illus., $6.50. American Technical Society, Chicago, Ill.

This book furnishes a comprehensive discussion of the tools, materials, and practices now prevalent in these closely related trades. Six chapters of the new material have been added to this edition, including up-to-date coverage of veneers, plywoods, and dense woods. Special emphasis has been placed on problems of layout and construction.

Designed as a basic text for vocational training and industrial arts classes, the thoroughness of coverage of the book make it also well suited as a handbook of instruction and reference for the skilled journeyman and for the woodshop instructor.

The 18 chapters of the book describe the cabinetmaker's work; safety practices; tools; joints; blueprint reading; board measure; stock billing; rod layout; the steel square; geometry used in layouts; lumber, adhesives, veneers, and plywood; standards of construction and design; doors; windows, sash and doors; interior trim and exterior woodwork; and stair layout.

The appendix contains a comprehensive list of cabinetmaking abbreviations.

Hi-Fi Loudspeakers and Enclosures

By Abraham B. Cohen. Paper, 368 pp., 5½ by 8½ in., illus., $4.60. John F. Rider Publisher, Inc., New York, N. Y.

This book is written by a man who is both a musician and an engineer. It will interest any hi-fi enthusiast be he a home crafter who wants to assemble his own hi-fi system from separate units, or an enthusiast who is satisfied with only the very best of the pre-assembled systems now on the market.

The subject is divided into three sections which describe the loud-speaker, the enclosure, and the room. The explanatory matter is clearly written and the whole is splendidly illustrated.

Fix Your Plymouth

By Bill ToBoldt. Cloth, 223 pp., 6⅛ by 8¾ in., illus., $2.95. The Goodheart-Willcox Co. Inc., Chicago, Ill.

This book is written for the shopmen and Plymouth owners who are looking for labor-saving shop kinks in making Plymouth auto repairs and adjustments.

The book discusses such subjects as tuning for best economy performance; simplified electrical service; valve conditioning; engine overhaul; cooling system service; carburetor and fuel system; clutch, universal joint, and propeller shaft servicing and transmission and overdrive servicing; rear axle servicing, brakes; wheel alignment, front suspension service, tune-up kinks; trouble shooting; mechanical and tune-up specifications.

Concrete and Masonry

By Emanuele Stieri. Paper, 277 pp., 5⅛ by 8⅛ in., illus., $1.75. Barnes & Noble, Inc., New York, N. Y.

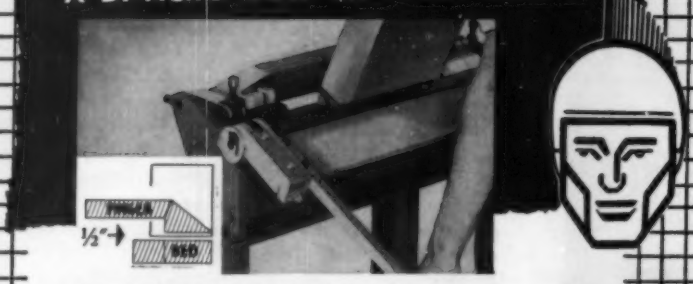
An excellent exposition on the use of concrete, bricks, stucco material, concrete block, glass block, painting and coloring masonry, household repairs, and projects for city and country homes.

The needed tools and equipment for this type of work are graphically described, methods of calculating the approximate amounts of materials to be used for various types of work such as sidewalks, porch floors, walls and steps, driveways, and fireplaces also are explained.

The book also contains tables of useful information.

(Continued on page 68A)

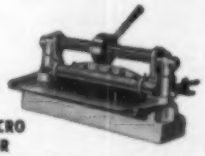
NEW SPARTAN MODEL 24
A DI-ACRO BOX AND PAN BRAKE



FORMS BOXES AND CHASSIS WITH UP TO ½" FLANGE

The Spartan's new design and rugged construction was planned specifically for school shops. Hardened Box Fingers are undercut to allow the forming of chassis and boxes as deep as 3" with lipped edges as large as ½" across. Material clearance of 1" between the Box Fingers and the Bottom Plate allows for easy insertion and removal of material. The Spartan bends 16 gauge mild steel up to 135° in one operation. It can also be used as a radius former and bar folder. An adjustable back gauge and a simplified stop control are standard equipment, *available in 24" width only.*

SPARTAN MODEL DI-ACRO ROLLER
Built exclusively for school shops in five widths, 12" to 36", all with 2" machined rolls. Form smooth cylinders with radii of 1" and larger in sheet metals up to 16 gauge. Heavy welded steel and cast construction.



DI-ACRO SHEAR
An industrial tool available to schools in 6", 9", 12" and 24" widths. Capacity 16 gauge steel.

DI-ACRO BENDER
Available in five sizes that form bar stock, flats and tubing in a minimum of change-over time.

pronounced die-ack-ro
di-acro PRECISION METALWORKING MACHINES

Please tell me about
☐ SPARTAN BRAKE ☐ SPARTAN ROLLER
☐ DI-ACRO SHEAR ☐ DI-ACRO BENDER

All products are backed by one year's warranty.
O'NEIL-IRWIN MANUFACTURING COMPANY
351 Eighth Ave. • Lake City, Minnesota
Name_____
School_____
Address_____

AUTOMOTIVE EQUIPMENT

(Continued from page 58A)

WRENCHES, ELECTRICAL
Open end, double end, thin chrome-moly forged steel, chrome plated electrical set of 9: 13/64" to 5/16" openings

WRENCHES, SOCKET
1/2" square drive and/or 3/8" square drive, thin wall, double broached, chrome alloy heat treated sockets. Chrome plated finish, 4 to 8 sets: 7/16", 1/2", 9/16", 9/16" extra thin for Ford V-8 85 h.p. connecting rods, 19/32", 5/8", 21/32", 11/16", 3/4", 25/32", 13/16", 7/8", 15/16"

WRENCH, HANDLE
11" — 1/2" and/or 3/8" square drive sliding "T" handle, alloy steel, lock-in plug connector

WRENCH, EXTENSION DRIVE
1. 5" — 1/2" and/or 3/8" square drive extension, alloy steel, lock-in plug connector
2. 10" — 1/2" and/or 3/8" square drive extension, alloy steel, lock-in plug connector

WRENCH, RATCHET (Reversible)
Ratchet gear, 1/2" and/or 3/8" square drive, quick reversible. Lock-in plug connector

WRENCH, DRIVE ADAPTER
1. 3/8" square female and 1/2" square male
2. 3/8" square male and 1/2" square female

WRENCH, TAPPET ADJUSTING
1. 1/2" — 9/16" open end, thin alloy steel wrench
2. 5/8" — 11/16" open end, thin, alloy steel wrench

WRENCH, UNIVERSAL JOINT
1. 3/8" and/or 1/2" sq. drive

Special Equipment and Testing Devices

Most of the special equipment used in the auto shop will last for a long time. Such things as compressors, grinders, welding torches, and creepers will stand up for many years with a minimum of periodic service.

Testing devices are more delicate and, consequently, more expendable. They must be repaired or replaced regularly. . . . It is of vital importance that meters, analyzers and testers be of the type used currently in the industry. The advice of local service people will be of great assistance when considering what types to procure.

AIR COMPRESSOR
1. 5 h.p., 26 cu. ft. min. capacity, max. pressure 150 PSI, complete with steel tank, regulator, pressure unloader, safety valve and piping
2. Air blow gun — forged brass, button valve type, 25 CFM at 100 PSI, specify hose size
3. Air line chuck — ball foot type with serrated shank. Specify hose I.D.

ALIGNING JIGS — for connecting rods

ARBOR PRESS — 25 ton hydraulic

BATTERY EQUIPMENT
1. Batteries, storage — automobile 6 volt, 100 amp. hour capacity; 12V, 50 amp. hr.
2. Battery carrier
3. Battery charger, tube rectifier type, 6 amp. capacity for 12 6-volt or 6 12-volt batteries
4. Battery charger, fast charger selenium rectifier type with charging rate controlled by battery temperature
5. Battery hydrometer with built-in thermometer
6. Battery syringe to water cells
7. Battery voltmeter, high rate discharge O-3V, high capacity resistance unit, prong type

BENCH
1. Electric test — facilities for testing: generators, regulators and starting motors, 3 h.p. min. motor, variable speed drive for approximately 500–6000 r.p.m. tachometer, voltmeter, ammeter, shunts and resistors
2. Work, with vises (4" vise)
3. Work, portable with vise

BRAKE EQUIPMENT
1. Lining grinder with necessary adapters to grind and centralize car brake shoes
2. Drum lathe with necessary attachments for both turning and grinding, including brake cylinder hones, lining clamps, and brake drum micrometer
3. Reliner — combination riveter and grinder
4. Lining bonder and remover (check electrical supply)
5. Brake bleeder

CONTAINERS
1. Can, safety gasoline — 1 gal. 24 ga. lead coated, non-spill sealed. Trigger type pouring lip
2. Can, waste — galvanized 12" x 15" can with legs and spring lift cover

CHAIN HOIST — with overhead trolley and monorail, 3 ton capacity

CLEANER
1. Steam — low pressure type (check local code)
2. Ring groove cleaner

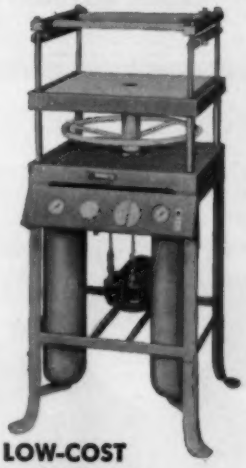
CORD EXTENSION LIGHT
Complete with molded rubber handle and socket. 20 feet super-service cable, molded rubber attachment plug and lamp guard

COMPASS — magnetic type needle

(Continued on page 62A)

KEEP PACE WITH INDUSTRY... offer training in plastics this low cost way

NEW, DI-ACRO PLASTICS PRESS FOR SCHOOL SHOPS—ONLY $595.00



This unusual Di-Acro plastics press enables school shops to take plastics out of the purely handicraft stage and to duplicate many creations of the modern plastics industry. The machine will perform all basic operations of the plastics forming industry—mechanical stretch forming, vacuum forming and blow forming.

A unique machine in any school shop, the Di-Acro Press fits well into conventional areas of industrial education. Students can get industrial-type experience from simple machine operation to the most advanced type of three dimensional plastics projects from student-made molds and plugs.

LOW-COST MATERIALS

Forming with the Di-Acro Plastics Press No. 18 makes use of one of the lowest cost materials on the market—the styrenes, in addition to acrylics and vinyls. A variety of colors are available in 18" x 24" sheets of both acrylic and styrene plastics in many thicknesses.

Write for free 14 minute demonstration film "FORMING PLASTIC SHEET MATERIALS" from O'Neil-Irwin Mfg. Co.

*pronounced die-ack-ro

di-acro PRECISION METALWORKING MACHINES

PLEASE SEND:
- Plastics Press Instruction Manual
- Plastics Price Sheets
- Plastics for the School Shop

O'NEIL-IRWIN MFG. CO.
351 Eighth Avenue • Lake City, Minnesota

Name_____

School_____

Address_____

AUTOMOTIVE EQUIPMENT

(Continued from previous page)

CREEPERS — 4 universal casters attached for easy movement

DEGREASER — with drum, filter and pump type circulated cleaning fluid

DRILL
1. Electric portable, ¼"
2. Electric portable, ½"
3. Press, 21", with motor and chuck

DYNAMOMETER
1. Chassis hydraulic absorption type
2. Engine hydraulic absorption type

ENGINE LIFTING EQUIPMENT — specify engine lift is to fit

ENGINE SUPPORT BARS — specify engine bars are to fit

FENDER COVERS

FURNACES — gas soldering

GAUGES
1. Cylinder gauge — dial indicator, universal type attachments complete in storage container
2. Compression meter, dial face for use in spark-plug chamber

GREASE DISPENSERS (chassis pressure type)

GRINDER
1. Cylinder, with motor and hone
2. Electric bench grinder, 2 six-inch dia. wheels, complete with motor, switch, guards and tool rests

GROWLER — 110 V-60 cycle, for testing generator and starter armatures

HONING MACHINE
Electric motor driven, for piston pins, king pins, etc., capacity to hone holes from ⅛" to 2⅝" inside diameter

HOT PLATE — electric — 110 V-60 cycle

JACKS
1. Floor roller, hydraulic type, 2 ton
2. Hand stationary hydraulic type, 1½ ton

LATHE — Metal bench type, 9" swing, back geared, motor driven

LIFTS
1. Automobile, hydraulic, twin post
2. Automatic transmission, hydraulic lift

MAGNET — permanent bar type ¼" x 1" x 6"

METERS
1. AVR 75 ampere D.C. 6, 12, and 24 volt scales d.c. complete with standard load resistor. Encased in durable portable case with heavy leads and clips attached
2. Meter, ammeter — 30 amp. capacity, encased in shock proof case
3. Meter, voltmeter — 10 volt rating

RADIATOR HYDROMETER — calibrated for alcohol, glycerine and ethylene glycol with built-in thermometer

SPRING TENSION SCALES
1. Brush and point spring tension scale 0–48 oz. spring type draw scale with hooked prong
2. Steering gear checking scale 0–4 lbs. spring type draw scale with steering wheel grip

STANDS
1. Car stand (horse) — 2 ton min. cap.
2. Engine build up stand, supported to swing through 360°, mounted on casters with locking device
3. Rear axle overhaul stand

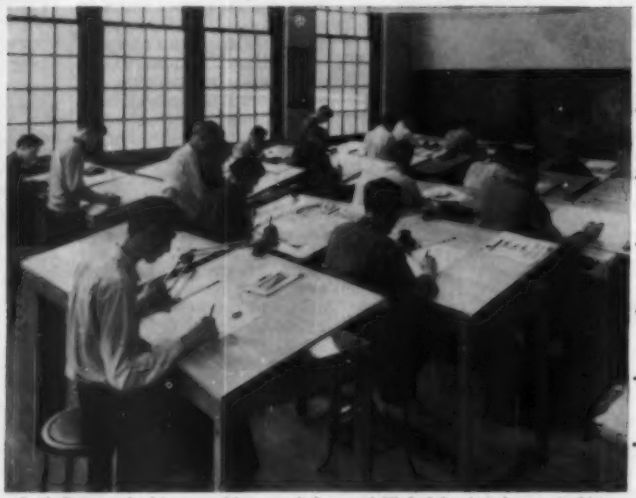
TESTERS
1. Coil tester to measure continuity, capacity, and resistance. Tester complete with coil heater and circuit interrupter — for hot and cold tests
2. Condenser tester to measure continuity, resistance, and capacity of condensers
3. Distributor tester, portable type complete for static and dynamic tests. For testing point resistance, dwell, mechanispark advance and vacuum advance
4. Motor tester analyzer, facilities for testing battery, starting voltage and current, cylinder compression, intake vacuum, ignition coil, condenser. Complete with tachometer, dwell meter, volt-amp-resistance and combustion tester
5. Power light tester. Synchroscope three lead type for making dynamic ign. timing
6. Spark plug cleaner and tester
7. Head light tester for focusing and adjusting headlight beam
8. Thermometer tester. Fahrenheit scale, glass tube mercury type. Scale 0° to 300° F.

TIRE SERVICE
1. Bead expander to compress crown of tire to force beads of tubeless tire against rim
2. Tire changer with bead breaker and roller
3. Tire gauge
4. Tire tester (water tank)
5. Tire repair kit (Tubeless)

VALVE RECONDITIONING EQUIPMENT
1. Valve refacer, electric. Motor driven grinding wheel. Universal motor driven valve stem chuck, mounted on adjustable feed base. 9/16" capacity, angle adjustment 30° to 90°, 110 V, 60 cycle motors, bench type
2. Valve seat grinder, complete with stones for popular car sizes
3. Valve spring compressor, adjustable for L head engines
4. Valve spring compressor, adjustable for overhead valve engines

WELDING UNIT
1. Portable oxyacetylene welding unit complete with 2 wheel carrier with cyl-

(Continued on page 64A)



Desk-Topper drafting machines at Lakewood High School, Lakewood, Ohio. Glenn Scott, Instructor. Installed by Cleveland Blue Print & Supply Co.

INDUSTRY URGES*

"Teach the proper use of drafting machines in the schools . . . where proper training habits can be developed"

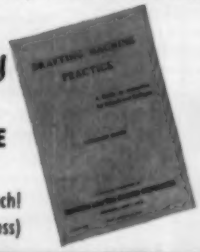
**Firm names upon request*

Write for Your Copy

Technical Text Material for

DRAFTING MACHINE INSTRUCTION

This 24-page booklet helps you teach! (Please include school name and address)



UNIVERSAL'S *Precision* DESK-TOPPER DRAFTING MACHINES

Made by the makers of Universal BOARDMASTER — the drafting machine preferred by industry!

UNIVERSAL DRAFTING MACHINE CORP.

7960 LORAIN AVENUE • CLEVELAND 2, OHIO

QUESTION: What makes one drawing board better than another?

Answer:

Drawing boards differ primarily in types of woods and methods of production.

Extensive research into many types of woods reveals that Basswood, above all others, provides the firmness, color, resistance to warping, resiliency and dimensional stability needed . . . and yet is economical enough to be well within a student's price range. Because of these features, POST drawing boards are made of carefully inspected, choice Basswood panels.

In production, extra care is taken to insure accuracy (true edges and uniform surfaces). Panel sections are bonded under high pressure by a high frequency electrical charge. Basswood end cleats, running the full length of the board, are joined by the tongue-and-groove method and then are glue bonded to the board itself for still greater strength. These advanced production techniques mean high quality, either in the popular school grade or the superbly finished professional boards.

The woodworking craftsmanship that goes into each POST board is characteristic of the entire POST line: T-squares (a full range for every budget), scales (boxwood, hardwood and plastic), precision cut triangles, curves and many other products used in classrooms and drafting departments.

Write today for your personal copy of the 1957 POST BUYING GUIDE, showing big price savings for classroom requirements.

POST

FREDERICK POST COMPANY

3648 N. Avondale, Chicago 18, Illinois

AUTOMOTIVE EQUIPMENT

(Continued from page 62A)

inder holder device. Including: acetylene regulator, oxygen regulator. Torch complete with tips Nos. 0, 1, 2, 3, 4, 6, 8, 10 and cutting attachment. Oxygen and acetylene hoses of 4 ply molded rubber with clamps. Welding goggles, nonmetalic, molded to fit facila contour, eye cups ventilated, adjustable nose band, No. 6, 50mm. safety lens and 50mm. clear protective lens. Fire extinguisher, trigger type, foamite type. (All equip. must be approved by National Board of Underwriters' Lab.)

WHEEL ALIGNMENT EQUIPMENT

1. Test rack with front pit preferred
2. 3-way alignment gauge set for camber, king pin inclination and caster, including adapter sleeve and clamp to fasten on to spindle. Also turning radius plates
3. Toe-in gauge
4. Wheel balancer. Type capable of testing static and dynamic balance of wheel on car

Special Tools

Special tools for servicing such equipment as automatic transmissions, power steering, and like devices should be requisitioned as required. Give complete purchasing specifications. This applies also to special pullers needed for steering wheels and other special tools.

Automotive Parts and Educational Units

This list of automotive parts should be consulted when developing the teaching devices or educational units which the student will use in preliminary training. His work and experience with these units will be of the laboratory type, in preparation for service work in the automotive service course.

These units must be modern, well maintained, and diversified so that the student can receive experience on all types and designs of similar equipment. An amortization schedule on this material is most important.

BRAKE ASSEMBLY — front and rear
Complete assembly including wheel, brake cylinder, linkage, and foot pedal for basic instructional unit on brakes. (Order mechanical hand, hydraulic, disc, etc., types which are used on current model cars.)

CARBURETORS
Current model carburetors used on popular model automobile engines

CHASSIS, AUTOMOBILE

1. Complete chassis with engine, starter, generator, regulator, and ignition system. All warning and electrical devices attached. (Basic instructional element for electrical work of all kinds.)
2. Chassis instructional element for front and rear suspension units, power transmission units including wheels and tires

DIFFERENTIALS
Complete with carrier, axles, and power drive. Order Hotchkiss drive and torque tube types. For assembly and disassembly

DISTRIBUTORS
Order distributors which are currently used on all popular automobile engines. Complete with distributor head, points, condenser, vacuum advance, automatic advance, and lube fitting (for use as basic training elements)

ENGINES

1. 6-cylinder overhead valve engine complete with clutch and transmission, ignition and fuel systems, in operating condition
2. 6-cylinder in line, L head engine complete with clutch and transmission, ignition and fuel systems, in operating condition
3. 8-cylinder V-type engine complete with clutch, transmission, fuel and ignition systems, in operating condition
4. Any type cut away engine
5. Used engines for assembly purposes. To be mounted for dead engine work

FUEL PUMPS
Order fuel pumps used on current engines. Vacuum, mechanical, magnetic, etc.

GENERATORS

1. Order d.c. generators used on current model automotive engines complete with pulley and terminals, 6 and 12 volt types
2. Order a.c. high output generator with d.c. rectifier and regulator (used on automotive two-way communication circuits)

IGNITION COILS
Order coils used on current model automobile engines 6 and 12 volt types (for basic training elements)

IGNITION CONDENSERS
Order condensers used on current model automobile engines (for basic training elements)

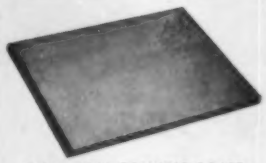
REGULATORS
Order 2 and 3 unit regulators complete with volt, current, and cutout coils. In good operating condition (for basic training element)

STARTING MOTORS
Order starting motor types which are used on current model automobile engines. Order complete with starting switch (manual and automatic) and with engaging mechanisms (Bendix and overrunning clutch)

STEERING GEAR ASSEMBLY
Order steering gear assemblies used on cur-

(Continued on page 72A)

MAYLINE



METAL EDGE DRAWING BOARD

MAYLINE
Invites Your Inquiries

Inquire about our attractive prices on: metal-edge drawing boards, drafting and art tables, folding tables, work benches, and "Gem" pedestal table. Letters answered promptly.

C7702 ART TABLE

C7703B DRAFTING TABLE

Symbol of MAYLINE Superiority

MAYLINE COMPANY
623 No. COMMERCE STREET
SHEBOYGAN, WISCONSIN

MAYLINE

new!

Higgins Super Black
for artwork with brush and pen

Higgins Acetate Ink
for plastic film and water-repellent drafting surfaces

Two Superfine Waterproof Black Inks of true Higgins quality

Your urgent demands led us to the creation of these new drawing inks. We are pleased to announce that there is an ink of Higgins quality for every graphic need. In 4 blacks, white and 16 colors.

At art material dealers everywhere

HIGGINS The international standard since 1880
INK CO., INC., BROOKLYN, N. Y.

On this...
instructors and students agree

BERGER "ALL-IN-ONE" DRAFTING KITS

All needed drafting tools in one easy-to-carry case.

Instructors like the way these all-in-one drafting kits bring students to class fully-equipped with every tool they need. Sessions get under way promptly without students begging the loan of a neighbor's protractor, a triangle, a scale.

Students welcome the way all their drafting tools are zipped up in one easy-to-carry case – easier to bring everything to class than leave any at home. It costs so little – in some cases less than buying the items individually.

You'll agree it's today's indispensable teaching aid – and learning aid, too. Tell your students about Berger Drafting Kits.

Recommended and used in hundreds of schools.

BERGER SCIENTIFIC SUPPLIES, INC.
39 Williams St., Boston 19, Mass.
Materials and Equipment for Engineers, Architects, Surveyors, and Draftsmen

BERGER DRAWING SET #510 Complete — high-grade scholastic set; in velvet lined case. Price including complete kit — $11.00.

T-710A With interchangeable nickel silver master bow — $9.40.

Prices quoted are for quantities of 6 or more kits. Instructors may buy sample kit at same low price.

YOUR CHOICE OF 6 DIFFERENT TYPE DRAWING SETS — PLUS

Protractor	French Curve
Architect's Scale	Draftsman's Tape
Engineer's Scale	Pencil Pointer
8" Triangle	2 Drawing Pencils
10" Triangle	2 Erasers

Inner compartments hold drawing and note papers — all in attractive, durable 16" x 24" simulated leather 3-way zippered carrying case of scuff-proof, water-proof Texon with slide-in type handles.

Write for literature and complete prices.

VEMCO drafting machines give vocational students "on-the-job" experience

Vocational education departments, equipped with VEMCO professional size drafting machines, are training students with the same type of drafting equipment industrial employers will expect them to use.

Built for Long Service
Permanently sealed ball bearings.
Pulleys and housings machined die castings.
Hardened steel, ground index plate.
Steel bands – continuous, no joints.

See your VEMCO dealer, or write:
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VEMCO
Drafting Equipment of Quality

This NEW Improved 801 SCHERR MICROMETER

has the Best BALANCED DROP-FORGED FRAME resulting in more accurate measurements in the hands of skilled and unskilled workers alike.

The Micrometer head is *"Lustro-Chrome"* furnished at NO EXTRA COST.

The Easy-to-Read 1/10,000" Vernier is furnished at NO EXTRA CHARGE.

0-1" Size with LOCKNUT and RATCHET and 10th Vernier (as shown)..... $11.75

0-1" Size - Plain 10th Vernier..... $9.75

Tungsten Carbide Tipped Anvils $2.50 extra

Other Sizes and Models Available

TODAY's *best buy in Precision Micrometers suitable and affordable for Schools, School-Shops, Students, Fine Mechanic's Inspectors, etc.*

It will pay to investigate SCHERR Micrometers before investing Tool-Dollars.

Special arrangements for Group-Purchasers, Educational Institutions and Schools.

A FULLY MODERN MICROMETER AT THE OLD REASONABLE PRICE

Ask for Micrometer Catalog—Code GIODI

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COMPLETE LINE OF PRECISION INSTRUMENTS
200-AR LAFAYETTE STREET • NEW YORK 12, N. Y.

Print-Shop Equipment

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films, and silent and sound movies may be used by the students in the industrial arts and vocational education courses.

BELLOWS
1. Hand, small size
2. Electric, blower type

BOOKCASE — for reference books, catalogs, etc., sectional preferable

BRAYER — 6 or 8 in. for proofing

BRUSHES
1. Bench
2. Benzine, No. 1, oval black
3. Floor
4. Padding, 1½ in. wide

BULLETIN BOARD

CABINETS
1. Galley, for double column, wood or steel, four tiers (to be used with typesetting machines)
2. Galley, for 8¾ by 13 in. galleys, wood or steel, four tiers
3. Ink and roller, to accommodate platen-press rollers, wood or steel
4. Matrix, for use with typesetting machines only
5. Roller, cabinet or rack for cylinder rollers
6. Supply, for leads, slugs, spaces, strip material, with top for lead cutter and mitering machine
7. Type, school type, each to accommodate two California cases, job cases, case slides, galley slide, and copy holder
8. Type, complete with 24 full-size California job cases, with overhead lead-and-slug cases, wood
9. Type, complete with 24 full-size California job cases, double work bank, wood or steel
10. Wood or metal, for filing class records, instruction sheets, etc.
11. Storage for cuts

CANS
1. Benzine, pint size
2. Benzine, 5-gal. size
3. Kerosene, safety, 1-gal. size
4. Waste can, fireproof, for rags

CASES
1. Blank, full-size, to accommodate ¼-size cases
2. Border, ¼-size, for ornamental borders
3. Lead and slug, regular size, to hold laborsaving fonts of leads and slugs
4. Metal furniture, to hold labor-saving fonts
5. Rule, ¼ size, for brass rule

CHAIRS — teacher's and tablet arm

CHALKBOARD — permanent or portable

CHASE RACKS
1. For platen presses
2. For cylinder presses

CHASES
1. For each size of platen press
2. For cylinder press

COMPOSING STICKS — 6 by 2 in., 8 by 2 in., 12 by 2 in., and 18 by 2 in., adjustable

CUTTER
1. Lead and rule
2. Paper, lever type, 20 in., with pedestal. Should handle 20 by 26-in. sheet
3. Paper, lever type, 26 or 30 in.
4. Paper, lever type, 30 in., with divided back gauge
5. 30 in. to 36 in. power cutter

DESK
1. Bindery, 80 by 36 in.
2. Drying rack
3. Imposing, 51 by 39 in.
4. Make-ready, 32 by 24 in.
5. Paper cutters', 80 by 36 in.
6. Proofreaders'
7. Teacher's

DRYING RACKS
1. Combination drying rack and stock table for platen presses, 30 trays
2. Trays, interlocking, for cylinder press

FOLDING BONES — for hand folding

FOLDING MACHINE — 20 by 26-in. size, 4 fold, two parallel and two right-angle folds, power

FURNITURE — iron, 2 by 4 to 10 by 15 picas

GALLEYS — Steel, 8¾ by 13 in., 6¼ by 23½ in., double column, and 12 by 18 in.

GAUGE PINS — spring tongue

GLUE POT — electric, 1-qt. size

IMPOSING TABLES
1. 12 by 18 in., with iron top, including reglets and furniture
2. 24 by 36 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
3. 36 by 48 in., with iron top, complete with galley slides, chase rack, reglets, and furniture
4. 39 by 63 in., with iron top, complete with drawers, letter boards, reglets, and furniture

INK FOUNTAINS
1. Short, for 8 by 12, 10 by 15, and 12 by 18 presses
2. Long, for 10 by 15, and 12 by 18 presses

KNIVES
1. Overlay, for make ready
2. Ink, 6 and 8 in.
3. Ink, 8 in., square end

LEADER BOXES

LEADERS
1. 6, 8, and 10 pt., fine dot
2. 8 and 10 pt., hyphen

LINE GAUGES
1. Metal, brass, or steel
2. Wood

MALLET

METAL FURNACE — for recasting and refining type metal, used only with typesetting machines

MITERING MACHINE

NUMBERING MACHINES
1. For use on presses
2. Hand machines

ORNAMENTS
1. Assorted floral and decorative designs
2. Border, 6 and 12 pt., decorative

PAPER-DRILLING MACHINE

PERFORATOR
1. 24-in., foot treadle
2. 28-in., foot treadle

PLANER
1. Mallets, hickory or fiber
2. Proof, maple, with felt bottom
3. Type, maple with leather top

PRESSES
1. Cylinder, two revolution, four roller, 17 by 22, complete with variable-speed motor, cast rollers, etc.
2. Platen, 8 by 12, with foot treadle, counter, flywheel guard, platen guard, brake, and set of cast rollers (motor and treadle combination if desired)
3. Platen, 10 by 15, complete with variable-speed motor, counter, flywheel guard, brake, and set of cast rollers, etc.
4. Platen, 12 by 18, complete with variable-speed motor, counter, flywheel guard, platen guard, brake, and set of cast rollers, etc.
5. Proof, 14 by 18, with cabinet
6. Proof, 20 by 24, with cabinet
7. Proof, 23 by 24½, with cabinet
8. Tableting

PUNCH
1. Foot power, multiple with assorted punches
2. Lever, two die, with assorted punches
3. Power, multiple, with assorted punches (paper drill may be substituted)

QUOINS
1. Sizes No. 1 and No. 2
2. Keys, Sizes No. 1 and No. 2

RULE — plain and brass (fonts to fit quarter cases)
1. 2 pt., laborsaving, hair line, side face
2. 2 pt. laborsaving, 1 pt. side face
3. 1 pt., laborsaving, 1 pt. face
4. 2 pt., laborsaving, double face

SAW TRIMMERS — pedestal type, with point gauge, and raising and lowering table

SILK-SCREEN UNIT

SPACING MATERIAL
1. Iron furniture, as selected
2. Leads, laborsaving, 2 pt.
3. Leads, 2-ft. strips, 2 pt.
4. Slugs, laborsaving, 6 pt.
5. Slugs, 2-ft. strips, 6 pt.
6. Spaces and quads
7. Thin spaces, brass and copper, assorted sizes, 6 to 8 pt., one size in each box

SPECIMEN DISPLAY BOARD

STAPLE BINDER — pedestal type, foot power

STEREOTYPING UNIT, 8 by 12 in.

STITCHER — wire, power, capacity ½ or ¾ in., flat- and saddle-back tables

TWEEZERS — 3½ in.

TYMPAN PAPER (with combination holder and cutter)
1. 18 in.
2. 38 in., upright, to be used with cylinder press only

TYPE
1. Body lightface — 8 and 10 pt.
2. Job lightface — 6, 8, 10, 12, 14, 18, 24, 30, 36, and 48 pt.
3. Job lightface italics — 8, 10, 12, 14, 18, 24, and 36 pt.
4. Job boldface — 6 and 8 pt., 12 pt., No. 26; 12 pt., No. 27; 12 pt., No. 28; 18 pt., No. 30
5. Job, light copperplate Gothic — 6 pt., Nos. 1, 2, 3, 4; 12 pt., Nos. 5, 6, 7, 8
6. Job condensed title Gothic — 12, 18, 24, 36, 48, 60, and 72 pt.
7. Job text type — 10, 12, 14, 18, and 24 pt.
8. Job, typewriter type — 12 pt. with spaces
9. Job, boldface italic — 8, 10, 12, 14, 18, 24, 30, and 36 pt.
10. Job, heavy copperplate Gothic — 6 pt., Nos. 21, 22, 23, and 24; 12 pt., No. 25
11. Wood, condensed Gothic — 8, 12, 15, and 18 line
12. 10 pt. line leaders 4 dots to the em
13. 10 pt. braces and dashes
14. 10 pt. fractions
15. 10 pt. references
16. Parentheses and brackets
17. 2 pt. laborsaving leads, 4 to 25 picas
18. 6 pt. laborsaving slugs, 4 to 25 picas
19. 2 pt. laborsaving brass rule
20. 2 pt. miters for rule
21. Laborsaving metal furniture
22. Thin spaces and quarter-size case

TYPESETTING MACHINES
1. Either linotype or intertype, 2 or 3 magazines, and molds
2. Matrices for same, 6, 8, 10, and 12 pt., as selected

VISUAL AID CHARTS

Print-Shop Supplies

BENZINE OR GASOLINE — for cleaning type or presses

BINDERY TAPE — 2 in. wide, brown or black

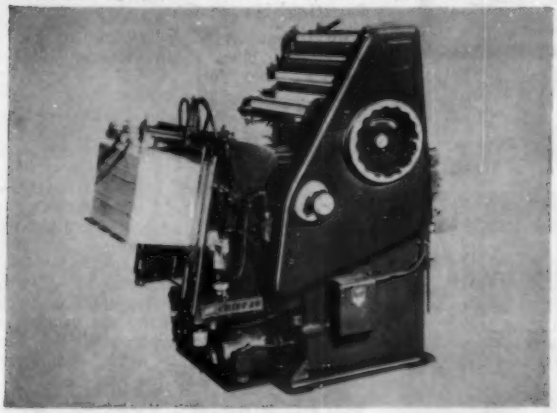
GOLD BRONZE — pale

INK
1. Bond, black, for bond papers
2. Book, black, for school papers, etc.

(Continued on page 68A)

Equip your Graphic Arts Department from ATF's complete line

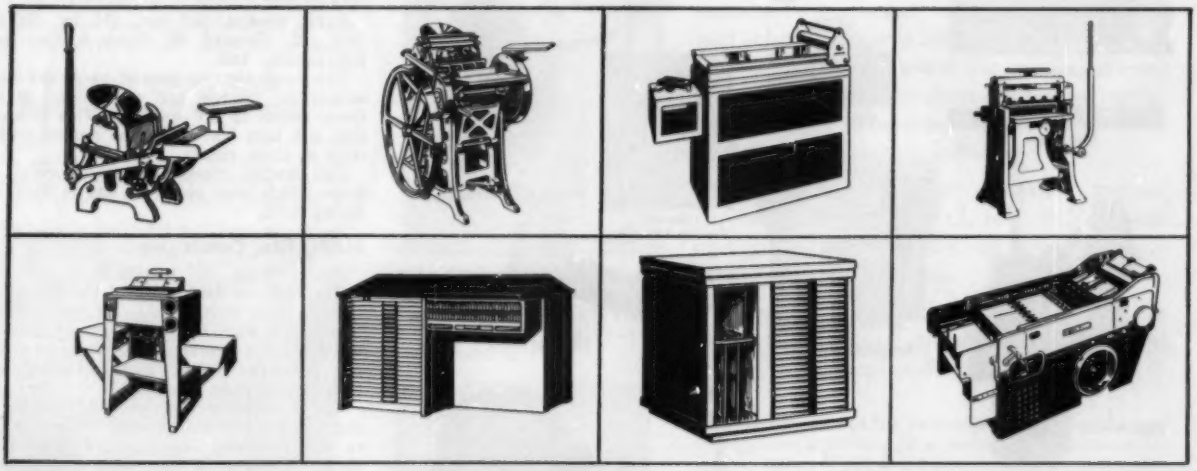
ATF CHIEF 15—the 11" x 15" offset unit that's simple to operate and comprehend. It demonstrates standard offset principles perfectly and is the ideal press for teaching the basic fundamentals of lithography. Phone ATF or write for complete information.



Because ATF offers the most universal, most complete line of presses and associated equipment available, your ATF representative is qualified and equipped to give you complete, unbiased recommendations on your graphic arts shop requirements. Count on a congenial meeting of minds when you speak to him.

He will be quick to grasp your problems. From purchasing new or used equipment to help in laying out and supplying a Graphic Arts department, you can rely on his experience and advice. Why not call your nearest ATF Branch Office and ask him to drop in?

ATF CHIEF 20—the 14" x 20" offset press that gives graphic arts students the perfect foundation for later operation of any size offset press. It's the simplest press to learn and operate in its size range, yet it has all the features and controls found on larger presses.



Challenge . . . Hamilton . . . Chandler & Price . . . Kenro . . . and many other leading Graphic Arts names are offered by ATF. For platen presses—manual or powered—paper cutters, paper drills, type cabinets, imposing tables, composing room furniture, platemaking equipment, cameras, or for any other need—check ATF, your most complete, single source for all printing requirements.

4877

American Type Founders ATF **200 Elmora Avenue, Elizabeth, N. J.**

better graphic arts instruction . . . from the most complete line of equipment

(Continued from page 66A)

3. Cover, colors as selected
4. Dryers and compounds, as selected
5. Half tone, black
6. Job, colors as selected
7. Metallic, gold and silver
8. Process, black, red, yellow, blue

KEROSENE — for cleaning rollers

PADDING CEMENT
1. Cold
2. Hot

PAPER
1. Bond, fine grade, 17 by 22 — 20, white
2. Bond, medium grade, 17 by 22 — 20, white
3. Bond, sulphite, 17 by 22 — 20, white
4. Bond, sulphite, 17 by 22 — 20, colors as selected
5. Book, enamel, 25 by 38 — 80, white
6. Book, machine finish, 25 by 38 — 80, white
7. Book, eggshell finish 25 by 38 — 60, white
8. Cover, as selected, 20 by 26, medium
9. Card Bristol, fine grade, 22 by 28 — 4 ply, white
10. Index Bristol, medium grade, 25½ by 30½ — 110, white
11. Index Bristol, medium grade, 25½ by 30½ — 140, white
12. Mill Bristol, medium grade, 25½ by 30½ — 140, colors as selected
13. Pressboard, red
14. Strawboard, No. 40 or No. 50
15. Tagboard, manila, 24 by 36 — 140
16. Tympan, to fit presses
17. Wrapping paper, size as selected
18. Holder for same

PASTE
1. Bindery
2. Make ready

SILK-SCREEN SUPPLIES consisting of:
1. Silk-screen process paste paint, 1 each of the following colors: toluidine red, strontian yellow, ultramarine blue, medium green, rich brown, orange, purple, white, and black
2. Solvent profilm in 11- by 14-in. sheets
3. 8-in. synthetic squeegee
4. 11-in. synthetic squeegee
5. No-clog varnish
6. Film solvent
7. Stencil filler
8. Filler remover
9. Stencil knife
10. Fiber guides
11. Red sable brush — ½ in.
12. Putty knife
13. Frame tape

TWINE — cotton, for tying jobs

WIRE STITCHING
1. No. 28 round wire for stitcher
2. Wire staples, ¼ in.

PRACTICALLY EVERY PRINTING PLANT IN THE WORLD USES ONE OR MORE OF THESE
Rouse PRODUCTS
For absolute accuracy and extra profits, order Rouse time-saving equipment. Write for complete illustrated catalog—today!
No. 40 Lead and Rule Cutter
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Newspaper Wall File
Lino Slug Cutter
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Form Truck
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2214 NO. WAYNE AVE. • CHICAGO 14, ILLINOIS
50 YEARS OF SERVICE TO THE PRINTING INDUSTRY

NEW PUBLICATIONS

(Continued from page 60A)

Practical House Carpentry

By J. Douglas Wilson. Cloth, 367 pp., 6¼ by 9¼ in., illus., $5.50. McGraw-Hill Book Co. Inc., New York, N. Y.

This book has been written by a man who has had years of practical experience as a builder topped off by years of teaching the subject and of writing magazine articles and books.

His book, therefore, can be of great help to the men in the field, to *build-it-yourself* enthusiasts, and to students in industrial arts and vocational education.

The nine chapters into which the book is divided present a brief history of carpentry, the story of lumber, carpenter's hand and power tools, joints used by the woodworker, laying the foundation, framing the house, putting on the exterior finish, and applying the interior finish and the hardware.

Key Check Points in TV Receivers

Spiral binding, 165 pp., 5½ by 8½ in., illus., $2. Howard W. Sams & Co., Inc., Indianapolis, Ind.

This book aims to present to service technicians the voltages and wave forms at key check points in TV receivers. This information will help him check the normal indications at these points.

The models covered in this manual are those which were produced late in 1951 and during 1952.

NAPC Film Catalogue

Paper, 29 pp., 5½ by 8½ in.

The National Association of Plumbing Contractors have prepared this list for plumbing contractors, plumbing inspectors, public health officials, union organizers and business agents, and apprentice instructors of plumbing, who wish to use these films.

The association operates this film library and has prepared this catalog list as a service to the plumbing industry. All films listed are provided with key letters to indicate whether they are best suited for apprentice training, selling and merchandising, technical, or public relations.

Definitions of Terms in Vocational and Practical Arts Education

Paper, 28 pp., 6 by 9 in., illus. American Vocational Association, 1010 Vermont Ave. N.W., Washington 5, D. C.

A book designed to give definite informa-

(Continued on next page)

NEW PUBLICATIONS

(Continued from previous page)

tion to general school administrators on what vocational education, and industrial arts means in our schools.

It is valuable also to the members of school boards, lay advisory committees, and the taxpayers who in the last analysis, are the people who pay for the upkeep of our schools.

(Continued on page 72A)

Business and Personal News

ADVERTISING MANAGER RETIRES

J. J. Krill

John J. Krill, advertising manager of *Industrial Arts and Vocational Education* from 1920 to 1948, recently announced his retirement. He had been associated with the Bruce Publishing Co., Milwaukee, Wis., since 1919 and served as advertising manager of the *Catholic School Journal* and *The American School Board Journal* magazines since 1920 to the present time.

Mr. Krill was one of the organizers of the Associated Exhibitors of the National Education Association and acted as president of the organization during the year 1946–47. He was widely active in the National School Service Institute during its early years. In Milwaukee he was active in advertising and publicity circles.

STANLEY TOOLS AND FRED J. GROSS HONORED

Stanley Tools, division of the Stanley Works, and Fred J. Gross, manager of educational sales for the division, were cited for their long service to vocational education at the fiftieth anniversary convention of the American Vocational Association held during December, 1956, in St. Louis, Mo.

Stanley Tools was presented a certificate for providing American Vocational Association members with the means to become acquainted with the latest tools and teaching aids of vocational conventions during the past 30 years.

Mr. Gross received his certificate for his interest in vocational education and his counsel to teachers of the practical arts. He has attended 29 annual conventions.

The convention was host to almost 3000 state and city supervisors of industrial education in the United States, as well as representatives from Formosa, Brazil, Bolivia, Chile, Indonesia, Australia, Paraguay, Iran, Costa Rica, India, the Philippines, Lebanon, Egypt, and Ceylon.

C. Kenneth Freedell, vice-president of Stanley Tools, division of The Stanley Works, congratulates Fred J. Gross, and (left) Charles L. Lohmeyer, general sales manager, Stanley Tools, for their contributions to the vocational education field

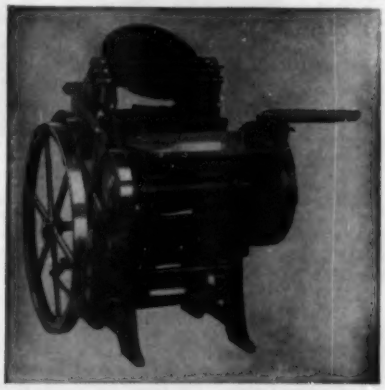
CONDÉ HAMLIN RECEIVES APPOINTMENT

Condé Hamlin, president of DeWalt Inc., a subsidiary of American Machine & Foundry Company, has been appointed to the newly-created position of deputy group executive of AMF's General Products Group, it was announced recently.

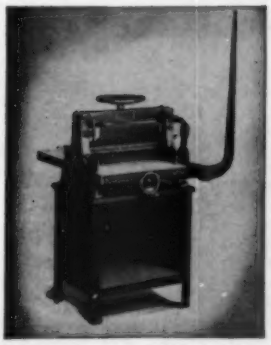
In his new position, Mr. Hamlin will be responsible for co-ordinating and supervising the operations of DeWalt Inc., manufacturer of homeshop and industrial woodworking equipment, AMF Cycle Company, Junior Toy Corporation, and BMC Manufacturing Corporation, all AMF subsidiaries, which manufacture a broad line of bicycles and juvenile wheel goods. He will also continue as president of DeWalt Inc.

(Continued on page 74A)

C & P NEW SERIES PRESSES These presses in sizes of 8x12, 10x15, 12x18 and 14½x22, provide the student with equipment that furnishes all practical requirements of hand fed press operation. May be equipped with flywheel, belt and platen guards. Also furnished for treadle operation instead of motor drive.



CHANDLER & PRICE
PRESSES and PAPER CUTTERS



C & P BENCH CUTTER An efficient, small size cutter that handles sheets up to 19" x 24". Equipped with two-handed safety control.

C & P PILOT PRESS A thoroughly efficient little press, chase 6½x10, that teaches basic principles of press operation with exceptionally fine printing results.

The Standard for Printing Education

C & P presses and paper cutters have been standard equipment in commercial plants and schools for over 50 years. So, the selection of C & P equipment for printing classes places before the students *practical* equipment exactly as used in commercial practice in the entire printing industry.

In addition, special safety features are incorporated, when desired, in C & P presses and paper cutters so that all safety requirements are fully satisfied.

For practical instruction—for safety in use—the foresighted administrator recommends . . . Chandler & Price.

"HANDBOOK OF PLATEN PRESSWORK" *is one of the outstanding aids to printing furnished without charge to printing instructors. If you do not have a copy, just request one.*

THE CHANDLER & PRICE COMPANY

6000 CARNEGIE AVENUE • CLEVELAND 3, OHIO

Automotive Equipment, Tools, and Supplies

These maximum lists may be found helpful in checking inventories or preparing budgets.

If possible, each shop should have access to a projector, so that slide films and silent or sound movies, may be used by the students in the industrial arts and vocational education courses.

AIR COMPRESSOR
1. 3 to 4 cu. ft., with tank, piping, and motor
2. Small portable, 1 cu. ft., with motor

ALIGNING JIG — for connecting rods

ANVIL
1. No. 100 or No. 125
2. Rim

ARMATURE GROWLER AND TESTER

AXLE STANDS

BATTERY EQUIPMENT
1. Cell tester, panel type with discharge rack
2. Charger (15-battery size) with rack
3. Charger (6-battery size)
4. Gas stove (small)
5. Lead-burning torches, with gauges and piping
6. Plate racks

BENCH
1. Electric test, elaborate
2. Electric test, simple
3. Work, with vises
4. Work, portable with vise

BLOWTORCHES — 1-qt. size

BOOKCASE

BRAKE
1. Adjusting stand
2. Band-lining machine

BULLETIN BOARD

CABINETS
1. Wood or metal, for bolts and supplies
2. Wood or metal, for filing job sheets and correspondence

CHAIN HOIST — with overhead trolley and track

CHAIRS
1. Teacher's
2. For tables, or with tablet arms

CHALKBOARDS

CRANE — portable

CRANKSHAFT TRUING TOOL

CREEPERS

DESK — teacher's

DRILL
1. Breast
2. Hand
3. Electric portable, ½ in.
4. Electric portable, ¼ in.
5. Press, 21 in., with motor and chuck

DYNAMOMETER — electric

FORGE — with blower and tools

FURNACES — gas

GREASE DISPENSERS

GRINDER
1. Cylinder, with motor
2. 8 in., and 12 in., with motor

JACKS
1. Lever, 1½-ton
2. Floor, roller

LATHE
1. 11 in. by 4 ft., with motor, chucks, and attachments
2. 16 in. by 6 ft., with motor, chucks, and attachments

POLISHER — power

PRESS
1. Arbor
2. 30 ton

SANDER — power

SPRAY PAINTING OUTFIT

VALVE REFACING AND VALVE-SEAT GRINDING EQUIPMENT

VULCANIZER
1. Electric steam for tube work
2. Small, hand

WELDING OUTFIT — with tanks, gauges, and cutting torch

WHEEL ALIGNMENT
1. Gauge
2. Test table

Automotive Shop — Small Tools

ALCOHOL TESTER

BATTERY
1. Cell tester, prod type
2. Cell tester, cadmium
3. Clips, large
4. Element pullers
5. Fillers
6. Funnels, glass
7. Hydrometer, acid
8. Knives
9. Post builders
10. Post drills
11. Post markers
12. Separator trimmer

BITS
1. Expansive
2. Ratchet brace
3. Wood, 3/16 to 1 in.

BOLT CUTTER — 24 and 36 in.

CALIPERS — 6 in. inside and outside

CANS
1. Oil, ⅓ pt.
2. 1 gal., gas, safety
3. 5 gal., gas, safety
4. 5 gal., kerosene
5. Waste

CHECKS — tool, 1000, blank

CHISELS
1. Cape, ¼ and 5/8 in.
2. Cold, ⅜, 5/8, ¾, and 1 in.
3. Diamond point

COMBINATION SQUARES — 12 in.

COTTER-PIN EXTRACTOR

DIVIDERS — 6 and 10 in.

DRILL SETS
1. 1/32 to ½ in., by 64ths
2. ½ to 1¼ in., by 32nds

FILE CARDS

FILE HANDLES — assorted

FILES
1. Flat bastard, 6, 8, 10, and 12 in.
2. Half round, 6, 8, 10, and 12 in.
3. Mill, 6, 8, 10, and 12 in.
4. Round, 6, 8, 10, and 12 in.
5. Square, 8, 10, and 12 in.

FIRE EXTINGUISHERS — Pyrene and Acid

FIRST-AID CABINET AND SUPPLIES

FLOOR BRUSHES — 18 in.

FUNNELS — tin, assorted sizes

GAUGES
1. Air pressure
2. Center
3. Depth
4. Thread
5. Thickness

GLASS CUTTERS

GOGGLES

GREASE GUNS — plain and pressure type

HAMMERS
1. Ball peen, 4 oz.
2. Ball peen, 1¼ lb.
3. Ball peen, 2 lb.
4. Lead
5. Riveting
6. Sledge, No. 12

LADLE
1. 3-in. bowl
2. 6-in. bowl

LAMPS — extension, with reels

LEAD POT — gas

MAGNET CHARGER

METERS — volt and ammeter test

MICROMETERS
1. Outside, 0 to 1 in.
2. Outside, 2 to 3 in.
3. Outside, 3 to 4 in.
4. Inside, 1½ to 6 in.

MOLDS
1. Battery nut
2. Battery post
3. Battery strap
4. Burning stick
5. Lead hammer

OILSTONE

PIPE TAPS, 1/8, ¼, 3/8, and ½ in.

PLIERS
1. Combination, 6 in.
2. Flat nose
3. Roundnose

PULLERS
1. Bearing
2. Gear
3. Wheel, hub type

PUNCHES
1. Center
2. Taper pin
3. Blacksmith

PUTTY KNIVES

REAMER — spindle bolt

REAMER SETS
1. Piston pin, ½ to 1⅜ in.
2. Taper pin
3. Valve seat

SAWS
1. Hack, frames, 10 in., adjustable
2. Hack-saw blades, 18, 20, and 24 teeth
3. Hand

SCALES
1. Steel, 6 in., graduated 1/64 and 1/100 in.
2. Steel, 12 in., graduated 1/32 in.

SCRAPERS
1. Bearing
2. Carbon

SCREW DRIVERS
1. 6 and 12 in.
2. Small combination

SCREW EXTRACTORS

SCRIBERS

SNIPS — tin, 3 in. straight and 3 in. curved

SOLDERING COPPERS
1. Assorted
2. Electric
3. Handles

SPRING SPREADERS

STAMPS
1. Figures, 3/16 in.
2. Letters, 3/16 in.

TAP-AND-DIE SETS
1. Machine screw
2. N.F. ¼ to 1 in.
3. N.C. ¼ to 1 in.

TIRE TOOLS

TOOL KIT — metal box or canvas roll, empty

TWIST DRILLS — (extra sets) selected sizes

VALVE
1. Grinders (hand)
2. Spring lifters

WRENCHES
1. 8, 10, 12, and 18 in.
2. Ignition sets
3. Pipe, 10, 14, 16, and 18 in.
4. Rim socket
5. Socket sets, large assortment with case
6. Spark plug
7. Speed wrenches
8. Standard end sets, ¼ to ⅞ in., N.C. and N.F.
9. Valve-tappet wrenches

Materials and Suppies

ABRASIVE CLOTH AND PAPER — aluminum oxide and silicon carbide

ACETYLENE GAS — in drums, for welding

ACID

ALCOHOL

BABBITT

BEARING BLUE

BEARING COMPOUND
1. 600W
2. Penetrating

BOLTS
1. Machine, selected sizes
2. N.F. selected sizes
3. Stove, flat or round heads, selected sizes

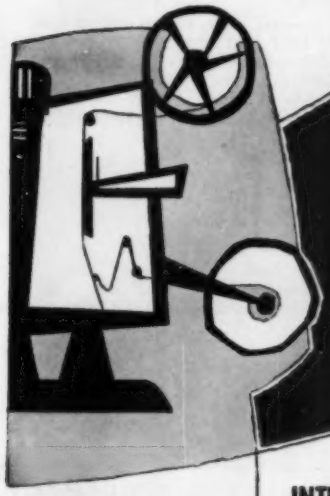
BRAKE JUICE — ½-pt. cans

BRUSHES
1. Paint
2. Spark plug
3. Spoke
4. Steel
5. Varnish

CHAMOIS

(Continued on page 72A)

UNITED WORLD FILMS



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- Grinders
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- Gear Hobbing Machine
- Broaching Machine
- Basic Machines
- Shaper
- Shop Practice
- Welding Procedures
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(Continued from page 70A)

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4. Wing, selected sizes
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3. Inner-tube repair stock
4. Patching cement
5. Patches
6. Putty
7. Tread stock
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AUTOMOTIVE EQUIPMENT

(Continued from page 70A)

rent model automobiles, complete with shifting lever, wheel, arm, column, and shifting link arms (basic training element). Include power steering types
TRANSMISSIONS
1. Order conventional transmissions used on current model automobiles
2. Order automatic type transmissions used on current model automobiles.

Furniture

The shop furniture should be in keeping with furniture used by other classes in other rooms of the school. Especially in the shop, it's wise to keep furniture painted, varnished, polished, and well cared for.
BENCHES — *see* section on Special Equipment and Testing Devices
BULLETIN BOARD
CABINET
1. Steel supply, 36" x 18" x 72" cabinet, double doors, locking, 4 shelves
2. First aid cabinet, 5" x 12" x 20" steel for first aid supplies, painted white
CHALKBOARD
DESK, TEACHER'S — 5 drawer
FILES — 4 drawer, legal size
FIRE EXTINGUISHER
Approved types according to local building and safety codes
SEATING
Provisions should be made for seating class: tablet arm seats are recommended
PROJECTOR
1. 16mm. sound motion picture projector
2. 35mm. comb. with 2" slide still-projector
SCREEN
6' x 8' beaded screen, tripod or wall mtng.

NEW PUBLICATIONS

(Continued from page 69A)

What We Can Do About the Drug Menace

By Albert Deutsch. Paper, 32 pp., 5 1/8 by 8 3/8 in., 25 cents. Public Affairs Committee, 22 East 38th St., New York 16, N. Y.

This is Public Affairs Pamphlet No. 186. The narcotic traffic is a real menace even though the author states that out of 60,000

(Continued on page 86A)

Pittsburgh COLOR DYNAMICS®

utilizes energy in color to improve efficiency and safety

That's why tomorrow's shopmen must know how to use this modern painting system to create better working areas

PITTSBURGH'S painting system of COLOR DYNAMICS is being included in many of today's courses in vocational training. This is the natural result of the growing recognition of the contribution that functional use of color is making to improve the efficiency, safety and morale of workers.

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BUSINESS AND PERSONAL

(Continued from page 69A)

Mr. Hamlin joined AMF in March, 1952, as assistant to the director of sales of the General Products Group. In August of that year, he was appointed general sales manager of DeWalt Inc. He was elected vice-president and director of DeWalt in August, 1954, executive vice-president in November, 1954, and president in May, 1955.

STANDARD OPENS NEW OFFICE

The Standard Electric Time Company of Springfield, Mass., have opened a new consulting engineering office at 16 Beale St., San Francisco, Calif., on January 15, 1957. This makes the third sales engineering office of "Standard," the other two being at Kansas City, Mo., and at the home office in Springfield. These are in addition to the 38 branch sales offices of the company.

Named to head up the new office is David W. Kearns of the sales engineering staff at Springfield.

The Standard Electric Time Company is the principal producer of electric supply and distribution switchboards and related laboratory equipment. It markets its laboratory apparatus under the trade name of Flexlab and sells to high schools, colleges, and industry.

NICHOLSON FILE COMPANY SUBSIDIARY

Nicholson File Company of Providence, R. I., has purchased the assets of the Danielson Manufacturing Company of Danielson, Conn., makers of molded and extruded Nylon products for industrial use, and has formed a new Rhode Island corporation of the same name. The new Nicholson subsidiary will continue to be operated by its present management, in close co-operation with Nicholson executives.

NEW REPRESENTATION

George W. Weatherby, vice-president in charge of sales of Portable Electric Tools, Inc., announced that they are being represented in the states of Tennessee, Georgia, Alabama, and Florida by the Reid H. Cox & Co., manufacturers representatives of Atlanta, Ga.

FREDERICK POST COMPANY EXPANDS

Frederick Post Company began operations January 1 at a new manufacturing plant and warehouse located at 5600 Harvey Wilson Drive, Houston, Tex. The new location more than doubles the size of the company's present location on Capitol Avenue.

Facilities consist of a new sensitized paper coating division, warehousing for engineering equipment and drafting supplies, and offices with a large customer parking area adjoining the building.

Increased demand for precision coated sensitized print papers, plus the need for expanded inventories of engineering equipment and supplies, led to Post's decision to build the new Houston plant to better serve the Southwest.

ATF CREATES NEW SALES EXECUTIVE POSTS

Steadily increasing sales by American Type Founders' Sheet-Fed and Web-Fed Press Divisions have made it necessary to create a number of new executive sales posts, it was announced recently by William W. Fisher, president.

John Porter has been named assistant sales manager of ATF's Sheet-Fed Press Division, under Dewitt G. (Dick) Manley, division sales manager. Mr. Porter was formerly assistant to the sales manager of the company's Web-Fed Press Division.

Henry Webendorfer has been named assistant to the sales manager of ATF's Web-Fed Press Division, under Douglass E. Murray, division sales manager.

Mr. Fisher pointed out that both new executives are American Type Founders "career men," and that their long experience in the graphic arts field and with ATF was an important consideration in their selection.

NEW ADDITION TO PLANT

The Standard Pressed Steel Company, Jenkintown Pa., is making a $1.4-million addition to the plant facilities of its Hallowell Steel Shop Equipment Division.

The company is one of the world's leading makers of precision threaded fasteners, and also a major producer of steel workbenches, cabinets, shelving and storage walls.

The plant is expected to be in operation by the middle of this year.

Descriptive Material

NEW ROCKWELL BULLETIN

A four-page, photo-illustrated bulletin describing the new rugged, versatile, big-capacity Delta 12-in. variable speed wood lathe has been issued by Rockwell Manufacturing Company.

Outstanding features of the new lathe are illustrated with close-up photos of parts of a dismantled machine. Line drawings are used to explain the most complex features.

The bulletin also includes complete catalog

(Continued on page 76A)

B-G offers a complete line for your Drawing Classes
WD-6 SIX STUDENT DRAWING TABLE
Designed by a school man to fit every school budget. Sturdy hardwood construction. Adjustable top can be held in many positions. Supplies maximum working area and storage space. Finished in natural lacquer. Overall dimensions—4" long, 31" wide, 39¾" high. Drawing surface 30" x 30"—instrument shelf 12" x 30"—Drawing Board storage area (holds 6 boards) 18" x 24" or 18" x 26"—6 Drawers, each with locks and master keyed. Immediate delivery. Price on request.
WD-2 ART & DRAWING TABLE
An all hardwood table with ref. shelf 10" x 24⅜" and large 10" x 16" drawer. Drawing area 26" x 24⅜". Overall length 36", width 24⅜", height 30". Finished in natural. Immediate delivery. Price on request.
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Features 2 tilting adjustable tops, stationary center top, open bookshelf, and 6 drawers with master-keyed locks. Sturdily constructed with maple and birch plywood throughout. Overall size: 60" wide x 24" x 36" high at front. Each tilting top, 24" x 24" birch plywood. Immediate delivery. Price on request.
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By Fryklund and LaBorge

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Recently revised beginner's text includes 10 new units. Covers 90 operations. Numerous step-by-step photographs explain printing procedures, equipment, layout, design, history and occupational information.
198 pages, Cloth bound, $3.00

#8 GENERAL SHOP ELECTRICITY

(Recently revised)

By Dragoo and Porter

Beginner's text in practical electricity. Includes 26 practical projects to demonstrate applications of electrical theory with explanations of how and why each works. Projects include radio construction and usable home appliances. Many illustrations. $1.50

#13 GENERAL ELECTRICITY

(Revised 1954 edition)

By E. W. Jones

A text to meet the needs of young people for a practical working knowledge of common everyday electricity. Course includes 23 units. Simple and direct in presentation and well illustrated with drawings and photographs. Several shop projects of practical nature.
120 pages, $1.50

#43 APPLIED DRAWING AND DESIGN

By Mattingly and Scrogin

A comprehensive beginning text in many practical branches of drawing. Technicalities minimized making it adaptable for less talented as well as talented. Numerous problems. Profusely illustrated.
232 pages, $2.60

#30 GENERAL SHOP METALWORK

By Dragoo & Reed

Basic text for beginning metalwork. Covers sheet, ornamental, bench, art metal, casting. Includes many projects.
104 pages, $1.40

#60 Graphic
ARCHITECTURAL DRAFTING

(New — 1954)

By J. Edgar Ray

One hundred and ninety-four sketches and views graphically present the principles and techniques of architectural drawing. These are correlated with working drawings, plans, and detail drawings.
256 pages, $4.80

#2 MACHINE WOODWORKING

By Robt. E. Smith. Fundamental operations with power tools. Understandable instruction.
152 pages, $3.00

#55 TEACHING SUCCESSFULLY THE INDUSTRIAL ARTS AND VOCATIONAL SUBJECTS

By Silvius-Curry. Practical suggestions for successful shop teaching methods.
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#75 GENERAL LEATHERCRAFT

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By Cherry. Designs and directions for 31 attractive projects. Detailed instruction for all operations. 356 illustrations.
144 pages, $1.50

#31 METALWORK TECHNOLOGY AND PRACTICE

By O. A. Ludwig. Complete book on general metalwork and allied trades. For text and reference use. 662 illustrations. 25-page index. $4.80

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ADDITIONAL SHOP BOOKS

- #36 GAS AND A.C. ARC WELDING AND CUTTING (Revised August, 1956) *By Royalston F. Jennings.* 104 pages, $1.50
- #80 ACTIVITIES IN CERAMICS — NEW (Publication date, June, 1956) *By Vernon D. Seeley.* 82 pages, $1.50
- #68 CONTEMPORARY INDUSTRIAL ART PROJECTS — NEW (Publication date, May, 1956) *By Dezso Sekely.* 94 pages, $2.50
- #32 MACHINE SHOP PROJECTS *By Roy E. Knight.* 25 usable projects. $1.50
- #9 PRINCIPLES OF ELECTRICITY *By Wendell H. Cornetet.* 342 pages, $4.00
- #28 INTRODUCTION TO APPLIED DRAWING *By Hale, McGinnis and Hill.* 82 pages, $1.00
- #14 BLUEPRINT READING AND SKETCHING *By R. Paul Lightle.* 72 pages, $1.00
- #17 BLUEPRINT READING, CHECKING and TESTING (Revised August, 1956) *By Otto A. Steinike.* Part I, instructions and questions, $1.20. Part II, blueprints (#18) $1.20
- #51 COMPOSING IN SPACE *By Richard G. Wiggin.* 48 pages, $1.25
- #27 SILK SCREEN PRINTING *By James Eisenberg.* 159 illustrations. $1.50
- #67 LINOLEUM BLOCK PRINTING (New in 1955) *By Francis J. Kafka.* 84 pages, $1.50

- #50 HOME MECHANICS *By J. C. Woodin.* 104 pages, $1.40
- #22 DRAWING APTITUDE TEST *By W. W. Mitchell.* Specimen set $0.35, 1-3 packages of 25, each $2.00, 4 or more packages, each $1.75.
- #81 GENERAL BOOKBINDING *By Chris Groneman.* 64 pages, $1.50
- #33 MACHINING OF METAL *By Robert E. Smith.* 224 pages, $3.60

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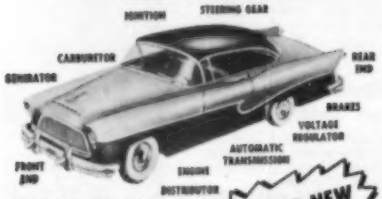

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BRAND-NEW REVISED EDITION!

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That's why so many instructors keep at least one copy of MOTOR'S new Auto Repair Manual in the school shop. It shows, in clear step-by-step words and pictures, the latest official shop methods for handling any service or repair job on any make or model built from 1946 through 1956. Tells where to start, what tools to use — leads student through entire operation!

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If satisfied, I will remit special 25 per cent discount School Price of only $5.21 (plus postage) for Auto Repair Manual (Reg. $6.95) — only $6.00 (plus postage) for Truck Repair Manual (Reg. $8.00) — only $1.20 (plus postage) for "Trouble-Shooter" (Reg. $2.00). Otherwise I will return book(s) in 7 days and pay nothing.

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DESCRIPTIVE MATERIAL

(Continued from page 74A)

listings of all motors and switches available for single-phase and 3-phase operation.

Also illustrated with photos are a number of spinning tools and attachments available with the lathe, including a metal spinning tool support, 3-jaw universal chuck, draw bolt, sanding attachment, 4-jaw independent chuck, and knowkout bar.

Further information may be obtained by writing Delta Power Tool Division, Rockwell Manufacturing Company.

(For Convenience Circle Index Code 0318)

SOUTH BEND LATHE CATALOG NO. 5700

The entire line of South Bend precision machine tools is illustrated and priced in a new 80-page Catalog No. 5700 by South Bend Lathe.

Equipment shown includes engine lathes, toolroom lathes, turret lathes, vertical spindle milling machines, bench shapers, drill presses, and pedestal tool grinders. Attachments, tools, chucks, and accessories for all South Bend machine tools are also listed.

New items introduced in this catalog include 16-in. swing and 16–24-in. swing long bed lathes taking up to 129 in. between centers, a complete line of electrical controls for lathes, precision measuring trays and rods for milling machine, and new accessories for turret lathes and drill presses.

Specifications including capacities, floor space requirements, and shipping weights for all machines are clearly tabulated. This catalog should be of interest to anyone responsible for the selection or use of machine tools. Sent free on request to any address. Write to South Bend Lathe Works.

(For Convenience Circle Index Code 0319)

SAMS ANNOUNCES NEW PUBLICATIONS

Howard W. Sams & Co. Inc., have introduced their latest book, "Metallic Rectifiers — Principles and Applications," by Leonard R. Crow.

This book presents theory, principles, and applications of the three most commonly used metallic rectifiers, namely, the copper-oxide, the magnesium-copper sulfide, and the selenium. Also presented are rectifier circuits, applications of power rectifiers and small current rectifiers, instrument rectifiers, and rectifiers used as electrical valves. One chapter discusses the new silicon type rectifiers. At the back of the book, electrical and metallic rectifier terminology is presented, along with a classified list of metallic rectifiers manufacturers, and a classified bibliography for those who desire further study of metallic rectifiers.

Priced at $3, the book contains 286 pages and is Howard W. Sams & Co. Catalog No. MRC-1. It is available through electronics parts distributors.

Another book announced recently is Volume Two of Sams' "Key Check Points in TV Receivers." It is the second of a new series which was first offered in March of 1956, and is designed to enable the service technician to save time in making tests on the operation of TV receivers. Proper voltage measurements and actual photographs of waveforms which should be present at key points in the receiver are shown. Peak-to-peak amplitudes are shown alongside the waveforms. By checking and analyzing at the points indicated, the service technician can determine whether or not the receiver is operating properly.

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WELDING

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Complete line of welding and cutting torches, regulators, accessories and safety equipment.

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3401-15 PINE BLVD., ST. LOUIS 3, MO.

General TV service work is greatly benefited through the utilization of the material presented in this book.

An index is provided which lists all models covered in both the first and second volumes. This volume covers receivers produced in late 1952 and in 1953.

The book is Howard W. Sams Catalog No. KCP-2. It contains 178 pages, and is priced at $2.

"Hi-Fi Handbook," Catalog No. HFB-1, by William F. Boyce, is a new and authoritative handbook on Hi-Fi equipment. It provides comprehensive information for audiophiles and technicians interested in Hi-Fi design, selection, installation, and servicing. Chapters cover: fidelity, sound theory and distortion; loud-speakers; baffels and enclosures; amplifiers, preamplifiers, and controls; program source equipment; systems design. selection, and installation. Of particular interest are the charts which make possible the accurate selection of component values in crossover networks for loud-speakers.

The material is presented in such a manner that it is readily understood by the novice as well as the experienced audio technician. It contains 240 pages, and is priced at $3.

(For Convenience Circle Index Code 0320)

CONSTANTINE'S MANUAL FOR CRAFTSMEN

Albert Constantine and Son, Inc., have issued their new Catalog and Reference Guide. It contains 124 pages of materials classified in separate sections, and has a complete alphabetical index on the last page. Besides presenting an introduction and a short story of the company's origin and plant, it covers their stock of supplies which are available to craftsmen under the general topics: veneers, books, inlay pictures, lumber, plywood, carved moldings, wood carvings, inlay borders, inlays, adhesives, small power tools, hand tools, "hard-to-get" hardware, finishing materials, upholstery supplies, plans, specialties for homeowners, plastics, furniture legs, and it includes an identification panel on how to identify wood (insert), with instructions on how to use. This manual, called the "Craftsman's Bible," offers possibilities of adding pleasure and profit to your present work, or if you are looking for a hobby, it will open up many avenues for you.

Further information is available by writing to the company.

(For Convenience Circle Index Code 0321)

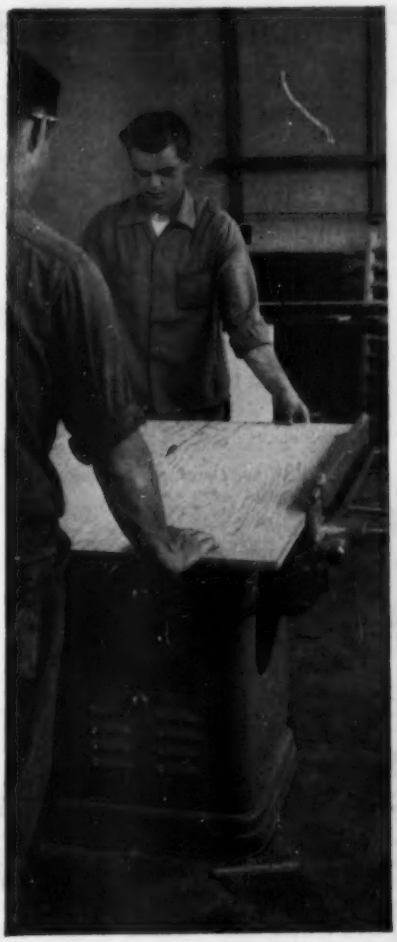
NEW BOOK ON DeWALT "POWER SHOP" MACHINES

A new hard-bound, feature-length book, published by the McGraw Hill Book Company, under the title "Easy Ways to Expert Woodworking," completely describes and fully illustrates the various uses and operation techniques of the DeWalt "Power Shop" multi-purpose woodworking machine. The book is now available from all franchised DeWalt retail dealers or from leading bookstores throughout the nation.

Authored by the well-known writer on various crafts subjects, Robert Scharff, "Easy Ways to Expert Woodworking" is 185 pages in length and prolifically illustrated with over 300 "how-to" photographs and line drawings. The price of the book is $3.95.

In addition to the many informative chapters devoted to the details of correct operation of DeWalt "Power Shop" machines, and all tools and accessories which can be used with the basic machines, there are also chapters in the book dealing with subjects such as shop safety, facts you should know when buying wood, general woodworking techniques, wood-finishing facts, and workbench designs. The book contains a detailed index.

(For Convenience Circle Index Code 0322)



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☐ STACKING CABINETS	☐ BUNK BED	☐ ODDS 'N ENDS CABINET
☐ BUFFET STORAGE CABINET	☐ BOAT BED	☐ 5' SAILER
☐ UTILITY SHELVES	☐ TRAIN TABLE CABINET	☐ 15' SAILBOAT
☐ TOOL-CABINET WORKBENCH	☐ COVERED SAND BOX	☐ 20' SAILBOAT
☐ DOUBLE DUTY DESK	☐ TOY STORAGE BLOCKS	☐ 11'3" OUTBOARD
☐ COFFEE TABLE	☐ PORTABLE GARDEN CADDY	☐ 9' FLAT BOTTOM DINGHY
☐ BEDSIDE TABLE	☐ SECTIONAL PATIO TABLES	☐ 7'9" PRAM DINGHY
☐ STUDENT'S DESK	☐ OUTDOOR SERVING WAGON	☐ 13'4" OUTBOARD
☐ CHEST OF DRAWERS		☐ 13'6" INBOARD RUNABOUT
☐ TWO-DOOR CABINET	☐ SUN SLED	☐ HOG HOUSE
☐ TV STOOLS	☐ GARAGE STORAGE BOX	☐ POULTRY HOUSE
☐ CHILD'S TUMBLER	☐ GARDEN CABINET	☐ ROLL-AWAY POULTRY NEST

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Ceramic Equipment, Tools, and Supplies

AUTOMATIC CONTROLS
1. Electronic temperature controls
2. Time controls

BATS
Plaster of Paris

BENCH WHIRLERS
1. Aluminum
2. Plastic
3. Setstone bats for whirlers

BOOKS

BRUSHES
1. Camel's hair
2. Squirrel
3. Fine red sable
4. Glaze

CELLOPHANE BAGS FOR STORING GREENWARE

CREAM-INK

CERAMIC DECALS

CERAMIC PENCILS

CHEMICALS
1. Feldspar
2. Flint
3. Gum arabic
4. Kaolin
5. Kiln patching cement
6. Kiln wash
7. Metallic oxides
8. Opax
9. Plaster of Paris
10. Plaster separator
11. Silicate of soda
12. Soda ash
13. White lead
14. Whiting
15. Zircopax

CLAY
1. Red modeling
2. White modeling
3. Fine white flower making clay
4. Porcelain

CONES — Pyrometric, 08–04 standard or junior; 020–018 standard or junior

CROCKS
1. 1-gal. size for glazing with covers
2. 5-gal. size for clay storage with covers
3. 10-gal. size for clay storage with covers

DAMP CABINET — old refrigerator or shop made

FETTLING KNIVES

GLAZES
1. Art
2. Crackle
3. Cold
4. Overglaze, various colors
5. Platinum
6. Under and overglaze mediums
7. Underglaze, various colors
8. Luster
9. Majolica
10. Matt

JARS — Pint and quart for storing glazes
1. Plate rack
2. Posts
3. Spurs
4. Standard stilts
5. Star stilts
6. Tile setters
7. Triangles

KILNS

KILN SHELVES
1. Full
2. Part

MODELING TOOLS
1. Boxwood
2. Fine-art plaster working
3. Lace tools
4. Moss decorator
5. Plaster
6. Sgraffito
7. Slip tracers
8. Wire loop

PITCHERS
1. Large — slip pouring
2. Small — glaze pouring

PLASTER-OF-PARIS MOLDS
1. [illegible]
2. Ash trays
3. Book ends
4. Candleholders
5. Candy dishes
6. Cigarette boxes
7. Dishes
8. Figurines
9. Flowerpots
10. Lamp bases
11. Mugs
12. Novelties
13. Planters
14. Salt and pepper shakers
15. Trays
16. Vases

POTTER'S WHEEL
1. Electric — constant speed, variable speed
2. Kick

SCALES

SIEVES OR STRAINERS — 30 mesh, 50 mesh, 80 mesh

SPONGES
1. Cellulose
2. Elephant ear

SPRAY BOOTH
1. Blower
2. Filters
3. Mask for spraying

SPRAY GUNS
1. Electric
2. Hand

TURNING TOOLS
1. Finishing rubbers
2. Rib
3. Right-and left-hand
4. Scrapers
5. Wire

WEDGING BOARD

Office Machines Repair, Equipment, Tools, and Supplies

The following lists for establishing an office machines repair program are minimum requirements. Additions may be necessary depending upon the extent to which training includes specialized office equipment.

The supply lists are minimum and include those items which should be stocked for general use. Specialized supplies required would depend upon the types and kinds of repairs being made.

Equipment

AIR COMPRESSOR — Pressure range 90 to 120 lbs.

AIR HOSE — 5/16 in. I.D. by 25 ft. with quick detachable connections

CABINET, SMALL PARTS — 10 drawer; 20 3/16 by 30 9/16 by 15 1/4 in.

DRILL PRESS — Complete with 1/2 in. Jacobs chuck, 10 in. by 10 in. working table

EXHAUST FAN — 1/4 h.p.-115 v., 60-cycle, single phase; fan diameter 16 in. — 6 blades, V belt drive, 2140 r.p.m., CFM 1945

GAUGE, SOLDERING

GRINDER — 6 in. H.D. Wheel — 6 in. by 3/4 in. face by 1/2 in. hole; 1/3 h.p., 115 v., single phase, 60-cycle, 3600 r.p.m. with guards, switch, cord tool rests, grinding wheels

LAMP, BENCH TYPE — Air cooled incandescent — 60-watt

LIGHT, VAPOR PROOF — 10 in. diameter, 30° adjustment, with conduit connection

LIGHTS, UNIVERSAL BENCH — With shade

MAGNETIZER-DEMAGNETIZER — 110 v., a.c.-d.c.

OVEN, ELECTRIC — 225° F @ 1000 watts; motor driven, forced-air ventilation, 30 in. wide, 25 in. deep, 24 in. high, 110 v. a.c., single phase, with thermometer

PARTS, CLEANER — Jet 38 in. long, 21 in. wide, 34 1/2 in. high; 110 v., 60-cycle a.c., single phase

SCREWPLATE — Including 4–36, 6–32, 8–32, 10–24, 10–32, 12–24, 1/4–20

SPRAY, BOOTH — With ventilation; inside 3 by 4 ft. by 6 ft. 10 in. high

SPRAY, GUN — Complete with KS-503 suction feed cup attachment, with quick detachable connector

TRANSFORMER, AIR

TURNTABLE, BENCH — With brake

VISE — Swivel type, jaws 2 in. wide

Small Tools

ALIGNER
1. Royal side
2. Underwood-side
3. Side
4. Royal type

BENDER
1. Link
2. Universal bar
3. Royal trip
4. Royal ribbon vibrator arm
5. L.C. Smith sublever
6. Royal bottom rail
7. Underwood back space
8. Woodstock lower bar

BLOW TORCH — Alcohol, blow 1 1/4 by 7 1/4 in.

CLEANING, GUN (Air)

FILE
1. 6 in. warding
2. 4 in. warding
3. 6 in. segment
4. 6 by 1/4 in. pillar
5. 6 by 1/2 in. pillar
6. 6 by 1/2 in. course pillar
7. 6 in. half round
8. 6 in. square

HACKSAW — Adjustable 10 in. — 12 in. blades

HAMMER
1. Ball peen, 6 oz.
2. Brass, 8 oz.

MILL, UNDERWOOD PLATEN END LOADER, ROYAL PINION BALL

OIL STONE — One side coarse, and the other fine

OIL STONE, TRIANGULAR

OIL CANS
1. Bench 8 oz.
2. Kit 1 oz.

PLIERS
1. 3 prong 7 in.
2. 9 prong 8 in.
3. Peening 7 in.
4. Wiring 7 in.
5. Long round prong 7 in.
6. Flat duck bill 7 in.
7. Parallel jaw 7 in.
8. Parallel jaw vise 8 in.
9. Chain nose side cutting 7 in.
10. Parallel jaw cutters 8 in.
11. Key lever peening 8 in.
12. Key ring 7 in.
13. Curved needle nose
14. Ribbon eyelet, male and female
15. Diagonal cutting
16. With type cutting jaws
17. With wire cutting jaws
18. Vise grip

PICK, ROYAL SEGMENT

PUNCH
1. Centering
2. Pin

(Continued on page 80A)

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School Department

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(Continued from page 78A)

REWINDER, RIBBON
ROLLER TYPE BAR — 8 in.
STRIPPER, PLATEN
SOCKETS, ROYAL
1. 7/32 in.
2. 1/4 in.
3. 5/16 in.
4. 5/32 in.
5. 3/16 in.

SCREWDRIVER

	Shank	Blade Length	Overall Length
1. Royal	7/32 in.		
2. Split nut	10 in.		
3. Split blade	12¾ in.		
4.	5/32 in.	2 in.	4⅛ in.
	5/32 in.	3 in.	5¾ in.
	5/32 in.	4 in.	7¼ in.
	5/32 in.	10 in.	13⅞ in.
	7/32 in.	4 in.	8¼ in.
	7/32 in.	7 in.	11¼ in.
	5/16 in.	8 in.	12⅞ in.

SCRIBERS, SPRING HOOK
TOOL, KEYRING REMOVING
TWEEZERS — 6 in.
HAND VISE
WRENCH — Underwood electric impression control screw adjusting
1. Royal — Open end, 1/4, 7/32 + 9/64, 5/16, 17/16, 13/32, 3/16 + 9/64, 3/8 in.
2. L. C. Smith — ½ and 3/8 in. (Motion); escapement; ribbon friction adjustment
3. Remington — 1/4 + ½ in., 3/8 + 7/32 in., 5/16 + 3/16 in., 1/4 + 3/8 in., 15/64 + 5/16 in.
4. Escapement
5. Motion adjustment nut
6. Segment shift stop screw nut
7. Margin release lever shaft stop screw
8. Ribbon vibrator universal bar
9. Woodstock, 1/8, 1/4, 3/8, 9/16 in.
10. Toggle 3/16, 1/4, 7/32, 3/8 in.
11. Box — 1/4 + 3/16 in. offset
12. Carriage rail screw
13. Universal bar nut upper

Supplies

BRUSHES
1. Tapered wire handle
2. Large cleaning
3. Enamel
4. Oil
5. Type cleaning
6. Benzine
7. Transfer cement

BUFFING COMPOUND — 2 lb. cans
CLOTH CLEANING-POLISHING
CEMENT, TRANSFER — 4 and 8 oz. cans
CLEANER, TYPE — 2 oz. — 7 oz. cans
EMERY CLOTH — Fine, medium, and coarse
ENAMEL, WRINKLE
1. Black
2. Grey
3. Brown

HANDLE, FILE
1. Large
2. Small

KIT, DECALCOMANIA
LACQUER, SPRAYING
1. Black gloss
2. Black dull
3. Grey, brown, green
4. Clear

LACQUER STICK, ENGRAVERS'
1. White
2. Black
3. Red
4. Blue
5. Yellow
6. Green
7. Gold
8. Silver

MARKING CRAYON OIL
1. Light typewriter
2. Non fluid ball bearing

POLISH, CLEANER — 8 oz. cans
PADS, TYPEWRITER
1. Wool felt
2. Sponge rubber

PASTE, SOLDERING
REDUCER, ENAMEL
REMOVER, RUST & TARNISH — 8 oz. cans, pts., qts.
STEEL WOOL
SOLDER
1. Acid core
2. Rosin core

THINNER, SPRAYING

Refrigeration Equipment, Tools, and Supplies

These lists for establishing a refrigeration program include all basic items. Individual instructors will likely devise special units and construct these units as necessary to augment standard equipment and small tools. Supplies listed include those items which should be stocked in the shop. They do not include specialized items necessary during the repair of specific refrigeration units.

Equipment

ACETYLENE REGULATOR, WELDING — 30 lb., 400 lb. capacity
ANALYZER, HERMETIC
BENCHES
1. Soldering
2. Service and assembly

(Continued on page 82A)

Kindt-Collins MASTER Products for use in Vocational Training Schools

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MASTER SHEET WAXES — for use in plastic arts.

MASTER ALUMINUM MELTING FURNACES — 50 and 100 lb. capacities.

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Employs rugged, shock-mounted self-shielded mechanism, shatterproof plastic window. Ideal for school use. Adapter available for current measurement of motors and appliances. One scale for all ranges and functions. Low cost.

All-purpose ANALYZER (Model 980)
A versatile, rugged VOM with a broad combination of ranges to measure Ohms, d-c current and volts, a-c volts. D-C sensitivity 20,000 ohms/volt. Single switch for all ranges and functions. Extremely compact, rugged, low cost.

WESTON
INSTRUMENTS

(Continued from page 80A)

CHUCK, ENGINE LATHE
1. 5 in. — 3 jaw universal
2. 7½ in. — 4 jaw independent

CUTTER PIPE — Capacity ⅛ to 2 in.

DOG, ENGINE LATHE — ½ to 4 in.

DRILL PRESS — Floor type, No. 2 Morse Taper-Jacobs chuck, capacity ¾ in.

DRILL
1. ¼ in. HD 7¾ in. overall
2. Morse straight shank HS set 1/16 to ½ in. by 64ths
3. Morse straight shank HS set A to Z sizes
4. Morse straight shank HS set Nos. 1 to 70, with block

EXTRACTOR — Bearing No. 1

FURNACE SOLDERING — 14 in. long, 13,000 BTU, fire pot opening 4½ by 3 in.

GRINDER — 115 v., single phase, 60-cycle, 10 by 1 by ¾ in. wheels, 1800 r.p.m.

GROWLER, ELECTRIC
1. Range 2 to 7 in., face 2¼ in., 110 v., 60-cycle
2. Range 2 in. up, face 4 in.

IRON, ELECTRIC SOLDERING — 300 watt, 110 v., a.c.-d.c., 14⅜ in. long, ⅞ in. tip

OHMMETER — Range .5 Ohm — 50,000 Ohm

OPERATION RECORDER — a.c. & d.c. up to 60 cycles, voltage range 120–250 volt

OVEN, ELECTRIC — 225° F. at 1000 watts, motor driven forced-air ventilation, 30 in. wide, 25 in. deep, 24 in. high, 110 a.c. single phase, with thermometer

OXYGEN REGULATOR, WELDING — 100 to 3000 lb. capacity, maximum delivery pressure, 50 lb.

PRESS, ARBOR — 1 ton capacity-Ram, 1 by 1 by 7 in., with slotted plate, single leverage

PUMP — Blower-vacuum, air cooled, 4.3 cu. ft. per minute. Pipe outlet-inlet ½ in., maximum pressure intermittent duty, 25 lb. maximum vacuum, intermittent duty 28.5 in., 115 v., a.c. 60-cycle, single phase, ½ h.p. motor

REAMER, PIPE — Capacity ⅛ to 2 in., HS cutter

SCREW PLATE — Including NC-NF standards

STARTER AND ANALYZER — Capacity up to ⅓ h.p.

TEMPERATURE RECORDER — 20° F. to +130° F. capacity, complete with charts

TESTER — Field coil, 110–220 v., 60-cycle

TESTER — Thermostatic control

THREADER — Ratchet pipe, capacity ⅛ to 1¼ in.

TOOL HOLDER
1. Engine lathe, straight shank, ½ to 1⅛ in.
2. Engine lathe, right hand shank, ½ by 1⅛ in.
3. Engine lathe, left hand shank, ½ to 1⅛ in.

TRUCK, APPLIANCE — Complete 2 wheel type with 15 ft. strap and ratchet

UNDERCUTTER — Mica, 110 v., a.c. motor

VISE — Combination pipe and machinist 4½ in. jaws, pipe capacity ⅛ to 3½ in.

WELDING OUTFIT — Any standard make with Nos. 1, 2, 3, 4, 5, 6, 7, 8, 9, 11 tips, hose and cutting attachments

BENDER, TUBE
1. External, ¼, 5/16, ⅜, 7/16, ½, and ⅝ in.
2. Internal, ⅜, ½, and ⅝ in.
3. Hand tube, mechanical, 3/16, ¼, 5/16, ⅜, ½, ⅝, and ¾ in.

BRUSHES, FITTING — ¼, ⅜, ½, ⅝, ⅞, 1⅛, 1⅜, 1⅝, and 2⅛ in. O.D. tubes

CHARGING LINE
1. Jumper end, 24, 30, and 36 in.
2. Quick coupler end, 24, and 36 in.

CLEANER, TUBE END — ½, ⅝, ⅞, and 1⅛ in. O.D. tubes

CUTTER, TUBE — ⅛ to 1¼ in., ⅞ to 2¼ in.

DETECTOR, HALIDADE LEAK

DRILLS, TWIST — High speed 1/64 to ½ in.

FLARING TOOL — Yoke and die, 3/16 to ½ in. tubing, ¼ to ⅝ in. tubing, ¾ to 1 in. tubing

GAUGES
1. Ammonia, 30 in., 150 lb., 30 in., 300 lb.
2. Retard, 30 in., 5 lb. retard to 200 lb.
3. Compound, 30 in., 150 lbs. with freon 12, 30 in., 60 lb. with: freon 12, sulphur dioxide, 0 to 300 lb., methyl chloride, carrene

GAUGE TESTER — ⅛ in. pipe threads

GOGGLES
1. Welding
2. Grinding

GUNS
1. Air
2. Cleaning

HAMMERS — Ball peen, 2 oz., 8 oz., ¾ lb., and 1 lb.

LIGHTER, TORCH — Friction type

OILER
1. Pistol, 6 oz., 13 in. spout
2. Pump, 1 pt., 15 in. spout

PINCH-OFF — ¼, 5/16, ⅜, and ½ in.

PLIERS
1. Side cutting, 5 and 6 in.
2. Diagonal cutting, 7 in.
3. Long nose, 6 in.
4. Thin nose, 6 in.
5. Pump, 5 slip adjustment
6. Eyelet, and grommet
7. Needle nose, 6 in.
8. Bent nose, 6 in.

PULLER
1. Wheel, 2 arm, 3 arm
2. Fly wheel, chain type
3. Seal ring
4. Oil ring

PUMP, TEMPERATURE AND PRESSURE — 50 lb. P., and 28 lb. vacuum

PUNCHES — Hollow, ¼, 5/16, ⅜, 7/16, ½, and 5/8 in.

REAMER, INNER-OUTER — 3/16 to 1½ in.
3/32 in. 5/64 in. 5/16 in.

REFACERS, SAE — Capacity ¼, 5/16, ⅜, ½, and 5/8 in.

SAWS
1. Hole, ⅞, 1⅛, 1½, 1¾, and 2¼ in.
2. Hack, 8 to 12 in.
3. Utility, 6 in.

SCREWDRIVERS
1. ⅛ in. blade thickness, 2, and 3 in.
2. 3/16 in. blade thickness, 1½, 3, 4, and 6 in.
3. ¼ in. blade thickness, 2, 4, 6, and 8 in.
4. 5/16 in. blade thickness, 8 in.
5. ⅜ in. blade thickness, 6 in., and 8 in.
6. Phillips, Nos. 2 to 4, and 5 to 9
7. Square, ¼ in. blade by 3 5/16 in., 5/16 in. blade by 3 5/16 in.

SNIPS
1. Straight 7, 10, and 12 in.
2. Circular 7, 10, and 12 in.

SOCKETS
1. Packing gland, ¼ in. drive Prong

Depth	Width	Diameter Inside
3/32 in.	⅛ in.	21/64 in.
⅛ in.	⅛ in.	29/64 in.
3/32 in.	5/64 in.	9/16 in.
3/32 in.	7/64 in.	5/16 in.
3/32 in.	5/64 in.	11/32 in.
3/32 in.	⅛ in.	21/64 in.

2. Valve packing nut, oval opening ½ by ⅜ in.
3. Deep and standard — midget, ¼ in. drive, 3/16, 7/32, ¼, 9/32, 5/16, 11/32, ⅜, 7/16, and ½ in., including extensions, handles, universals, and ratchet plugs
   Ferret — ⅜ in. drive, ⅜, 7/16, ½, 17/32, 9/16, 19/32, ⅝, 11/16, ¾, 15/16, and ⅞ in. including extensions, handles, universals, and ratchet plugs
   Master — ½ in. drive, double hexagon, ⅜, 7/16, ½, 9/16, 19/32, ⅝, 11/16, ¾, 25/32, 13/16, ⅞, 15/16, 29/32, 1 1/16, 1⅛, 1 3/16, and 1¼ in. including extensions, handles and universals
   Heavy duty — ¾ in. drive, 1 1/16, 1⅛, 1¼, 1⅜, 1 7/16, 1½, 1⅝, 1¾, 1 13/16, and 1⅞ in. including handles and extensions
4. Valve stem — 3/16, 7/32, ¼, 5/16, and ⅜ in., ¼ by 5/16 in., ¼ by 7/32 in.

SWEDGE TOOLS — ¼, 5/16, ⅜, ½, ⅝, and ¾ in.

TACKER, GASKET

TESTERS
1. Control
2. Hermetic
3. Sling psychrometer
4. Thermometer — wall, pocket, remote dial thermometer
5. Moisture indicator — freon and methyl
6. Circuit, 90 v., d.c., 60 v., a.c., 500 v. a.c./d.c.

VALVE KIT — Service set for hermetically sealed units

VISE SAWING — 3/16 to 4 in. capacity

VOLTMETER — 65 volts, 660 volts, a.c. and d.c.

WRENCHES — Open end
1. Ignition type, 7/32 to 15/64 in., ¼ to 9/32 in., 17/64 to 19/64 in., 5/16 to 11/32 in., and ⅜ to 7/16 in.
2. Short open end, 3/16 to 7/32 in., ¼ to 5/16 in., 5/16 to 11/32 in., ⅜ to 7/16 in., and ½ to 9/16 in.
3. Tappet type, 7/16 to ½ in., ½ to 9/16 in., and ⅝ to 11/16 in.
4. Heavy duty, ⅜ to 7/16 in., 7/16 to ½ in., ½ to 9/16 in., 9/16 to ⅝ in., 19/32 to 11/16 in., ⅝ to 11/16 in., ⅝ to ¾ in., ¾ to ⅞in., 25/32 to 13/16 in., and 15/16 to 1 in.

WRENCHES — Box
1. Double Broached, ⅜ in. to 7/16 in., ½ to 9/16 in., 19/32 to 11/16 in., ⅝ to ¾ in., 25/32 to 13/16 in., ⅞ to 15/16 in., 1 to 1⅛ in., 1 1/16 to 1¼ in.
2. Double Hex., 5/16 to ⅜ in., ⅜ to 7/16 in., 7/16 to ½ in., ½ to 9/16 in., 9/16 to ⅝ in., ⅝ to ¾ in., 11/16 to 13/16 in.
3. Half Moon, 7/16 to ½ in., 9/16 to ⅝ in., ⅝ to ¾ in.
4. Vise grip, 7 and 10 in.
5. Welding tank
6. Pipe, 6, 8, 10, 14, 18, and 24 in.
7. Flare nut, ¾ by 1 in., ⅞ by 1⅛ in.
8. Refrigerator ratchet, reversible or non-reversible ½ in., 3/16, and ¼ in.
9. Adjustable 4, 6, 8, 10, 12, 18, and 24 in. Bristol, No. 4 to ½ in. Allen, 3/16 to ½ in.

Refrigeration — Supplies

ACETYLENE

BELTS, VEE — Variety of sizes to service refrigeration units

CAPS, PLUG

CARBON TETRACHLORIDE — 1 gal. to 5 gal.

CLOTH, EMERY — 50 yd. rolls 1 in. No. 80 coarse, No. 100 medium, No. 150 fine

COMPOUND, LAPPING — 320 grit — 500 grit

CORD, RUBBER COVERED
1. 2 conductor
2. 3 conductor

DEHYDRANT — 1 oz. to 1 pt. containers

FILLERS, PLASTIC

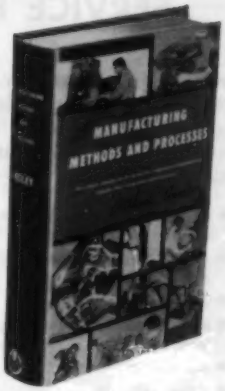
FITTINGS
1. Couplers, compression, female ¼ in. SAE
2. Compression nut, tube size: .078–.086 in. O.D., .086 to .096 in. O.D., .096 to 109 in. O.D., .110 to .118 in. O.D.
3. Capillary tube, Male SAE, ¼, 5/16, ⅜, ½, ⅝ in.

(Continued on page 85A)

"Bridging the gap between drawing board and final product." — *Frank N. Piasecki, President, Piasecki Aircraft Corporation.*

Manufacturing Methods and Processes

ARTHUR C. ANSLEY



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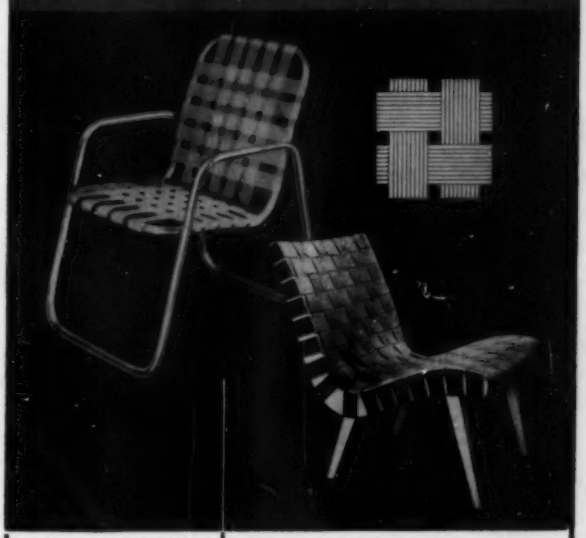

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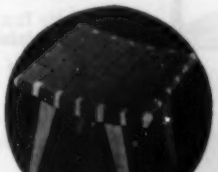

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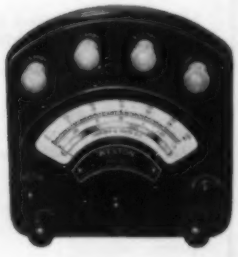

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IAVE

(Continued from page 82A)

4. Ammonia
   90° elbows, 2000 lb. working pressure: ⅛, ¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, and 2½ in.
   Tees, 2000 lb. working pressure: ⅛, ¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, and 2½ in.
   Couplings, 3000 lb. working pressure, ⅛, ¼, ⅜, ½, ¾, 1, 1¼, 1½, 2, and 2½ in.
   Reducing couplings, ¼ by ⅛ in., ⅜ by ¼ in., ½ by ⅜ in., ¾ by ½ in., 1 by ¾ in., 1¼ by 1 in., 1½ by 1¼ in., 2 by 1½ in.
   Straight flange unions, oval: ⅜, ½, ¾, and 1 in., square: 1¼, 1½, and 2 in.
   Steel tongue and groove: ¼, ⅜, ½, and ¾ in.
   Flanged adaptors, male I.P.S., ¼ by 1½ in., ¼ by 1⅝ in., ¼ by 1¾ in., ¼ by 1⅞ in., ¼ by 2 in.
   Flanged adaptors, female I.P.S., ¼ by 1½ in., ¼ by 1⅝ in., ¼ by 1¾ in., ¼ by 1⅞ in., ¼ by 2 in.
5. Refrigerant drum adaptors, ¾ in. FPT by ¼ in. flare, ¾ in. FPT by ⅜ in. flare, ½ in. FPT by ¼ in. flare
6. Flare seal bonnet, ¼, ⅜, ½, ⅝, ¾ in.
7. Fusible metal plugs, 150°–162° F. melting, ⅛, ¼, and ⅜ in. male pipe
8. Strainer union, 150 mesh, ¼ by ⅝ in., ¼ by ¼ in.
9. S.A.E. flared fittings — coupling nuts, reducing nuts, caps, plugs, union couplings, half union couplings, female couplings, pipe plugs, reducing couplings, fitting reducer, swivel nut valve connector, bushings, union elbows, half-union elbow, female elbow, valve connectors, extra heavy half union, brass tee, reducing tee, M.P.T. on run tee
10. Wrought copper fittings: elbows, 90°, straight, 90°, reducing, 45°, straight, 90°–45° street elbows
    Tees, wrought, reducing
    Reducing couplings
    Return bends
    Unions
    Reducing bushings
    Adaptors

FLUX
1. Brazing
2. Cast iron
3. Aluminum
4. Soldering

FUSES
1. Clear windows, 6, 8, 10, 15, 20, and 30 amps.
2. Cartridge, 6, 8, 10, 15, 20, 25, and 30 amps.

GASKETS
1. Inner, door seal, ½ in. dia. by ¾ in. flange
2. Rubberized fabric, 3/16, ¼, 5/16, ⅜, ½, and ⅝ in. cushion diameter; ¼, 5/16, ⅜, ½, 9/16, and ⅝ in. flange
3. Grease proofed, ¼, 5/16, ⅜, and ½ in. cushion diameter
4. Alloy metal, .006, .010, and .015 in. thickness
5. Asbestos, 1/64, 1/32, and 1/16 in. thickness, 24 by 36 in. sheets
6. Flare gaskets, copper, ¼, ⅜, ½, ⅝, and ¾ in. I.D.

HOSE, PURGING — ¼ in. I.D. to ½ in. O.D., 50 ft. lengths

JOINT COMPOUND

KEYS, WOODRUFF — ⅝ by ⅛ in., ½ by ⅛ in., 1½ by ¼ in.

LAPPING PAPER — No. 320 fine, No. 400 very fine, No. 600 finest

LEAK DETECTOR — 2 oz. to 1 gallon containers

OIL
1. Graphite penetrating
2. Thread cutting
3. Compressor

OXYGEN

REFRIGERANTS
1. Sulphur dioxide, 25, 100, 150 lb. tanks
2. Methyl chloride, 15, 60, 100, and 140 lb. tanks
3. Freon, F12, 25, and 145 lb. tanks
4. Freon, F22, 22, and 125 lb. tanks
5. Freon, F114, 145 lb. tanks
6. Methylene chloride, 1 qt. to 5 gal.

ROD, WELDING
1. Steel, ⅛ in. diameter
2. Bronze, ⅛ in. diameter

SCREWS, ALLEN SET — No. 10 by 3/16 in., ¼ by ¼ in., 5/16 by 5/16 in., ⅜ by ⅜ in., 7/16 by 7/16 in., ½ by ½ in.

SEALING COMPOUND — Insoluble in refrigeration gases

SILICA GEL — 18–20 mesh for liquid line, 6–12 mesh for suction line

SOLDER
1. 50–50
2. Silver
3. 95–5

STEEL, WOOL — No. 0, fine, No. 1, Standard

STRAP, PERFORATED BRASS — ½ to ¾ in. wide

TAGS, IDENTIFICATION

TAPE
1. Friction, ¾ in.
2. Rubber, ¾ in.

TUBING
1. Copper capillary, .031, .040, .050 in., I.D.; .091, .110, .120 in., O.D.
2. Soft copper, 50 ft. rolls, ⅛ in. O.D., .030 in. wall thickness; 3/16 in. O.D., .030 wall thickness; ¼ in. O.D., .030 in. wall thickness; 5/16 in. O.D.; .032 wall thickness; ⅜ in. O.D., .032 wall thickness; ½ in. O.D., .032 in. wall thickness; ⅝ in. O.D., .035 in. wall thickness; ¾ in. O.D., .035 in. wall thickness

(Continued on next page)

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(Continued from page 85A)

3. Hard copper, 20 ft. lengths, ¼ in. O.D., .025 in. wall thickness; ⅜ in. O.D., .030 in. wall thickness; ½ in. O.D., .035 in. wall thickness; ⅝ in. O.D., .040 in. wall thickness; ¾ in. O.D., .042 in. wall thickness; ⅞ in. O.D., .045 in. wall thickness; 1⅛ in. O.D., .050 in. wall thickness; 1⅜ in. O.D., .055 in. wall thickness; 1⅝ in. O.D., .060 in. wall thickness
4. Sponge insulation, ¼ in. I.D., ¾ in. O.D.; ⅜ in. I.D., ¾ in. O.D.; ⅜ in. I.D., 1 in. O.D.; ½ in. I.D., 1 in. O.D.; ⅝ in. I.D., 1 in. O.D.; ¾ in. I.D., 1¼ in. O.D.
5. Dehydrated copper, 3/16 in. O.D., .030 in. wall thickness; ¼ in. O.D., .030 in. wall thickness; 5/16 in. O.D., .030 in. wall thickness; ⅜ in. O.D., .032 in. wall thickness; ½ in. O.D., .032 in. wall thickness; ⅝ in. O.D., .035 in. wall thickness; ¾ in. O.D., .035 in. wall thickness
6. Sponge rubber, ¼ in. I.D., ¾ in. O.D.; ⅜ in. I.D., ¾ in. O.D.; ⅜ in. I.D., 1 in. O.D.; ½ in. I.D., 1 in. O.D.; ⅝ in. I.D., 1 in. O.D.; ¾ in. I.D., 1¼ in. O.D.

NEW PUBLICATIONS

(Continued from page 72A)

addicts, only 1/6 are teen-agers. Saving only a small percentage of these teen-agers is worth while and the little booklet will give the reader an idea how to start out on the job of saving young and old addicts.

Educators Guide to Free Tapes, Scripts, and Transcriptions, 1957

Edited by Walter A. Wittich and Gertie Hanson Halsted. Paper, 184 pp., 8 7/16 by 10-13/16 in. Educators Progress Service, Randolph, Wis.

This is the third edition of this guide. It is a completely new edition. It lists 57 free tapes, 177 free scripts, and 96 free transcriptions.

The material is listed under conservation (natural resources), health education, home economics (consumer education), language arts (creative expression-literature), safety and accident prevention, and social studies (aviation, biography, community agencies, geography, guidance, history, social objectives).

Progress Report by the Cabinet Committee on Small Business

Paper, 14 pp., 5¾ by 9 in., 15 cents. Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

This little brochure outlines the problems of small business, the federal policies and programs, and the committee recommendations on taxation, procurement, financing and technical aids, competition and paperwork.

It also describes the impact on the federal budget.

American Business Dictionary

By Harold Lazarus. Cloth, 522 pp., 5⅝ by 8 3/16 in., $10. Philosophical Library, Inc., New York, N. Y.

This dictionary covers the fields of accounting, advertising, banking, business law, business economics, credit and collections, data processing, display, finance, government regulations, industrial engineering, industrial psychology, insurance, labor relations, management, marketing, market research, personnel administration, power production, public relations, real estate, retailing, statistics, stocks and bonds, taxation, transportation and wholesaling.

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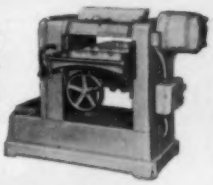

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Shop Equipment News

POWER-SPEED CONTROLLED SCREW DRIVERS

Black & Decker Manufacturing Company announces an innovation in the development of portable electric screw drivers — a means of controlling both the power and speed of the units. With their new Power Speed Control coupled to a Black & Decker Scrugun or Screw driver, an infinite number of instantaneous adjustments are possible to drive screws far smaller than those for which the tool was designed. This control unit is especially valuable in precision industries, where extremely fragile screws can now be production driven without injury in delicate materials such as ceramic, plastic, and glass.

The new Black & Decker Power Speed Control Unit attached to a Black & Decker Scrugun

The Black & Decker No. 8 Scrugun independently drives screws of a No. 8 size. When combined with the Power Speed Control, adjustments of finger lightness can be set by dial, and screws down to a No. 0 size can be driven.

They also announce a ¼-in. Standard Holgun, a new version of their famous lightweight, powerful Heavy-Duty Holgun Drill. Designed to meet the need for a moderate-priced general service portable electric ¼-in. drill with Heavy-Duty Holgun features, the new tool has the capacity for use wherever a professional drill is needed for jobs not requiring continuous, assembly line production. It is ideal for use in garages and body shops, as well as for plumbers, carpenters, installation men, and maintenance men.

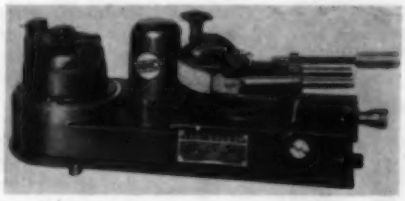
The new No. 10 Pistol-Grip Scrugun has been added to the portable electric screw driver line of Black & Decker. Formerly, the No. 10 size was available only with a center drive design that is adaptable for overhead suspension in assembly work. The new No. 10 Adjustable and Positive Clutch Scruguns are designed with the famous "Pistol-Grip Trigger Switch" features that permit the operator to hold the tool comfortably like a gun, facilitating work on equipment that requires screw driving in awkward positions. For jobs in inaccessible places a special model of the No. 10 Pistol-Grip Scrugun is also available with a 90-deg. angle head.

For more complete information on the many additional features of these tools, write to Black & Decker Manufacturing Company.

(For Convenience Circle Index Code 0301)

AMMCO MODEL 2000 "SAFE-ARC" BRAKE SHOE GRINDER

Ammco Tools, Inc., are the manufacturers of the "Safe-Arc" Brake Shoe Grinder which is used to grind the lining on automobile brake shoes to the exact arc of the brake drum for 100 per cent efficient lining to drum contact.



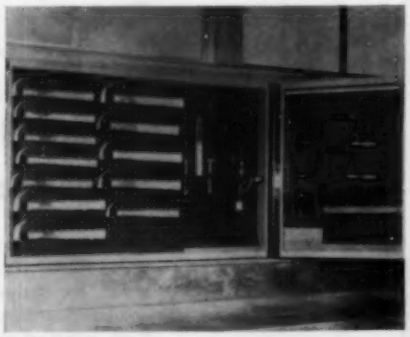
Ammco Model 2000 Safe-Arc Brake Shoe Grinder

The "Safe-Arc" will handle all shoes 8 in. through 17 in. diameter. It is easy to use. Only two adjustments are necessary. A set of eight shoes can be ground accurately in less than four minutes.

(For Convenience Circle Index Code 0302)

MASONITE "PEG-BOARD" PANELS

Masonite Corporation are the manufacturers of Masonite "Peg-Board" panels and fixtures. A special study just completed by Dr. James D. MacConnell and Dr. Raymond C. Schneider of Stanford University School Planning Laboratory reveals an increasing demand by teachers "for more and better ways to utilize wall surfaces in their instructional activities."



Masonite "Peg-Board" Panels

The growing demand for economical rehabilitation of old school buildings, as well as the economical construction of new school buildings, is creating further demands of extensive research for more versatile building materials.

Write for further details.

(For Convenience Circle Index Code 0303)

NEW METAL STYL-IZE SAFETY SPECTACLE

The United States Safety Service Company are offering a new metal safety frame, designed for the popular Styl-Ize Safety Lens shape that has swept industry and received nationwide acceptance since its introduction two years ago in a plastic safety frame.

Styl-Ize Safety Spectacles

Modern, clean-flowing lines, and attractive design are outstanding features of the new Metal Styl-Ize Safety Spectacle. For the first time velvet-soft flexible polyethelene nose pads have been used. These pads can be removed without tools and easily adjusted for greater comfort.

With USSSCO'S Optilite or Hardened Glass Lens mounted in this new frame, the entire unit meets all Federal Specifications for strength, optical qualities, impact and piercing tests, and resistance to corrosion.

Further information is available by writing to the company mentioned above.

(For Convenience Circle Index Code 0304)

NEW CRAFTOOL PRINTMAKER

Craftools, Inc., announces the new Craftool Printmaker graphic arts press.

The Printmaker is a complete self-contained press that will handle the three basic printing processes required by the graphic artist: etching-drypoint, relief printing (wood block, linoleum cut, type), and the lithograph. The change-over from one process to another is accomplished very simply by interchanging the upper roller, which takes but a few minutes.

New Craftool Printmaker Model No. 5120

The many features of the Craftool Printmaker make it an outstanding contribution to the art of modern printmaking.

A free catalog covering the Printmaker is available.

(For Convenience Circle Index Code 0305)

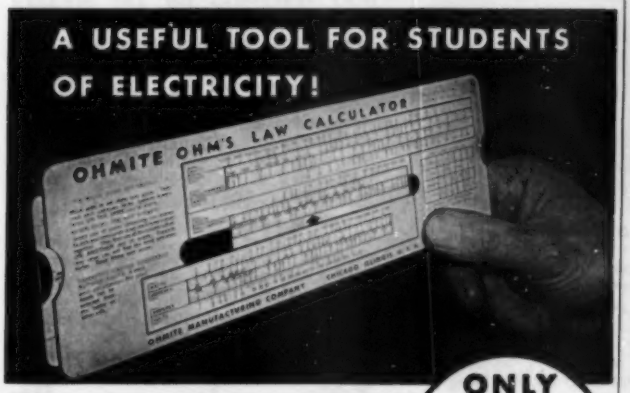
NEWMAN TILTING ARBOR SAW

Newman Machine Co. Inc., are now offering a new attachment for the Newman K-16 Precision Tilting Arbor Saw which provides for accurate ripping up to 48 in. wide. This attachment is a micrometer box type rip fence with rock and pinion adjustment.

This fence adjustment control engages both

(Continued on page 90A)

OHM'S LAW CALCULAT
AND SLIDE RULE



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TEACHERS! ONLY 15¢ each in quantities of 25 or more

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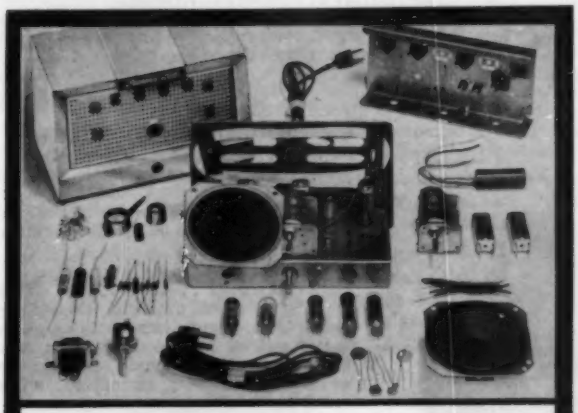

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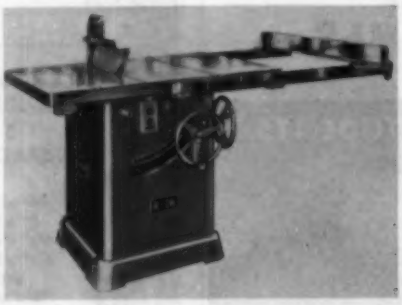
SHOP EQUIPMENT NEWS

(Continued from page 88A)



Newman K-16 Variety Saw

the front and rear guide rails. Rotation of control crank moves both rails simultaneously and carries fence in perfect alignment with saw, at any setting, from 0 in., to 48 in. Scales are provided for accurately setting fence on either side of saw. A handwheel is provided on the control crank for locking the rails on both sides of the table. The fence may also be set and locked to the rails, front and rear, at any desired position.

The Newman K-16 has a cast iron base and column, a direct motor drive with 5-h.p. motor, and is equipped with a 16-in. saw blade which projects 4 in., above the table at 90 deg., and 2½ in. at 45 deg.

Further information is available from the manufacturer.

(For Convenience Circle Index Code 0306)

ALL-NEW POWER HAND TOOL

Chicago Wheel and Manufacturing Company, manufacturer of Chicago mounted wheels, abrasives and Handee grinders, announces the development of an all-new Hi-Torque Handee, Series 6000. Among the many new features of the tool are extra speed and power, streamlined design, larger air vents to permit increased air velocity for cooler operation, larger oillite bearings for longer life, and all-new built in chuck lock for quick change of accessories.

All-new Hi-Torque Handee, Series 6000

The new Hi-Torque Handee was developed for use as a complete hand workshop, for household maintenance and all-round shop use, as well as for the master craftsman, homecrafter, and hobbyist. The tool weighs 14 ounces and operates at 25,000 r.p.m., for grinding, cutting, carving, drilling, sanding, sawing, engraving, polishing, cleaning, burnishing, and gunsmithing. The Hi-Torque Handee

(Continued on page 94A)

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5. **FUNDAMENTALS OF ELECTRICITY, McDougal-Ransom-Dunlap-Graham** **$3.50**
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7. **METALLURGY**
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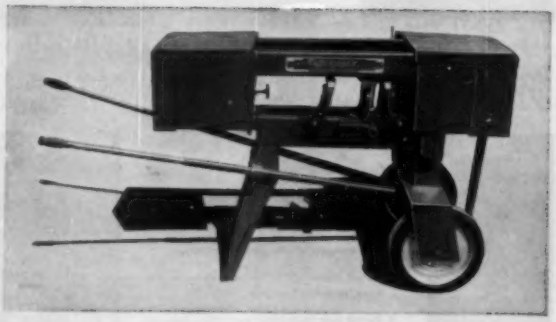

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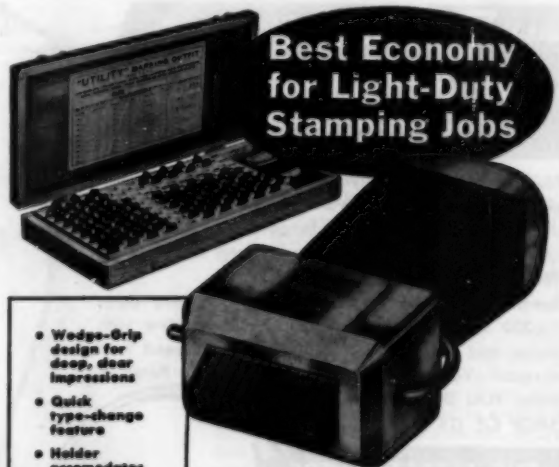

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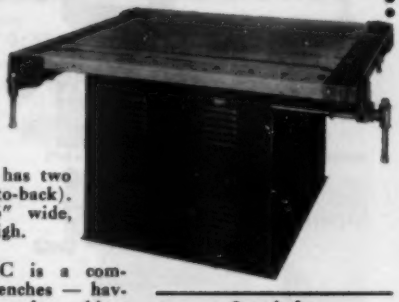

2. No. 64-50-402C has two steel cabinets (back-to-back). Each cabinet is 36″ wide, 21″ deep and 31″ high.

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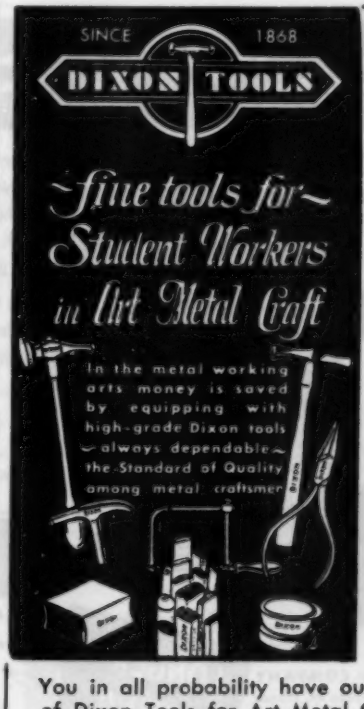
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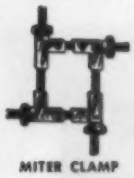
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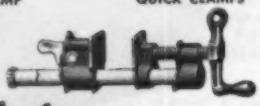

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SHOP EQUIPMENT NEWS

(Continued from page 90A)

works in wood, hardened steel, nonferrous metals, glass, ceramics, and plastics, and is available for operation at 110 or 220 volts, 25 to 60 cycles, a.c., or d.c., and has a complete set of all-purpose accessories and steel carrying case.

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(For Convenience Circle Index Code 0307)

A FLUSH BASE FOR GYRO-VISES

The Columbian Vise & Mfg. Co., have designed a replacement for standard fixed-position Gyro-Vise bases. The flush base is ideal for applications where it is desirable to keep the working surface free of obstacles when the vise is not in use. Loosening of a setscrew on the side of the base drops the upright post level with the work surface. It is held there by a retaining rod.

Columbian Gyro-Vise Flush Base

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Additional flush bases can be placed in different locations and the Gyro-Vise easily moved from place to place.

Additional information and Bulletin LL-3987, are available on request.

(For Convenience Circle Index Code 0308)

KNIGHT-KIT INTERCOM KIT

Allied Radio Corporation announces the release of their new Knight-Kit Intercom System Kit. This two-way system consists of a master station, remote station, plus 50-ft. connecting cable.

It offers an economical, convenient method of intercommunication for the home, office, or factory.

Knight Intercom System Kit

The master unit combines both the volume control and "on-off" switch in one knob.

(Continued on page 100A)

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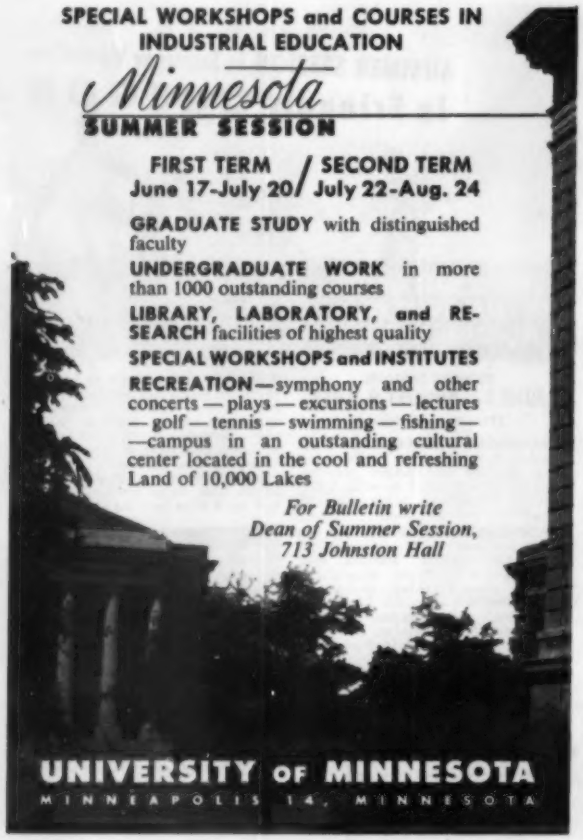

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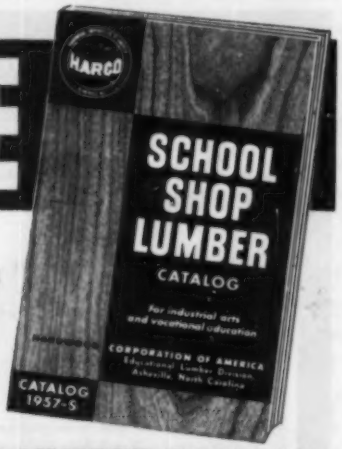

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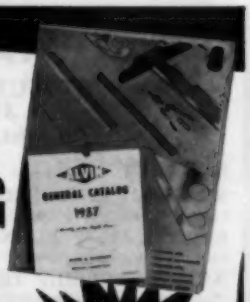

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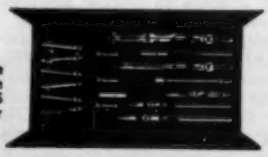

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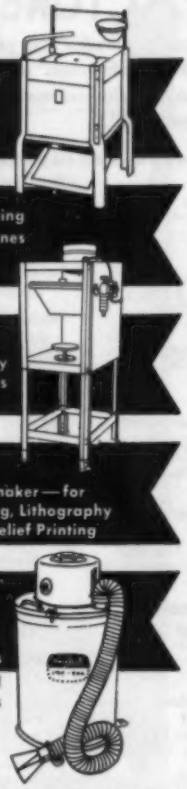

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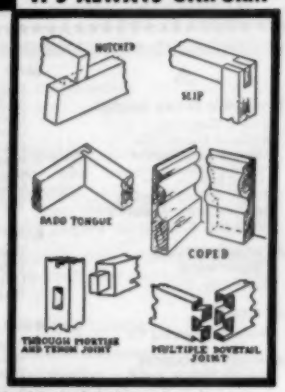

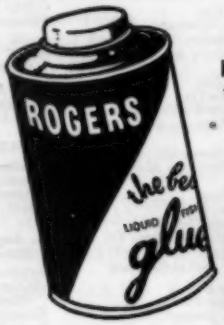

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Boice-Crane Co.
Brodhead-Garrett Co.
Curtis Mfg. Co.
Delta Mfg. Co.
DeWalt Products Corp.
Duro Metal Products Co.
Oliver Machinery Co.
Patterson Bros.
Shopsmith, Inc.
Walker-Turner Co., Inc.
Yates-American Machine Co.

DESKS, Instructors'
Parent Metal Products, Inc.

DIVIDING HEAD
L. W. Chuck Co.
Scherr Co., Inc., Geo.

DO IT YOURSELF PROJECTS
School Products Co.
Stueck, Inc., W. Whitney

DOWEL POINTERS
Brodhead-Garrett Co.
Patterson Bros.

DOWELING JIGS
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

DRAFTING MACHINES
Alvin & Company
Modern School Supplies
Universal Drafting Machine Corp.

DRAFTING PAPER
Alvin & Company
General Finishes Sales & Service Co.
Modern School Supplies
School Products Co.

DRAFTING PENS
Alvin & Company
Berger Scientific Supplies, Inc.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
V & E Mfg. Company
Weber Co., F.

DRAFTING TABLES
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Engineering Mfg. Co.
Hamilton Mfg. Co.
Keuffel & Esser
Modern School Supplies
Parent Metal Products, Inc.
Post Company, Frederick
Sheldon Equip Co., E. H.
Stacor Equipment Co.
Standard Pressed Steel Co.
Stoner Wood Products Co.
Tolerton Co.
Weber Company, F.

DRAFTSMEN'S INSTRUMENTS
Alvin & Company
Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Fairgate Rule Co.
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
School Products Co.
V & E Mfg. Company
Weber Company, F.

DRAWING INSTRUMENTS REPAIR PARTS
Alvin & Company
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Engineering Mfg. Co.
Modern School Supplies
Post Co., Frederick
V & E Mfg. Company
Weber Co., F.

DRAWING OUTFITS
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Berger Scientific Supplies Corp.
Brodhead-Garrett Co.
Dietzgen Co., Eugene
Engineering Mfg. Co.
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
V & E Mfg. Company
Weber Co., F.

DRAWING PAPER IN ROLLS AND SHEETS
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Brodhead-Garrett Co.
Dietzgen Co., Eugene
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
School Products Co.
Weber Co., F.

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Boice-Crane Company
Brodhead-Garrett Co.
Columbia Machinery & Supply Co.
Delta Mfg. Co.
Duro Metal Products Co.
Patterson Bros.
Shopsmith, Inc.
South Bend Lathe Works

DRILL SHARPENERS
Atlas Press Co.
Brodhead-Garrett Co.
Patterson Bros.
Snap-on Tools, Corp.

DRILL STANDS, BENCH, POST, PEDESTAL
Black & Decker Mfg. Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Dixon, Inc., Wm.
Duro Metal Products Co.
Patterson Bros.
Snap-on Tools, Corp.
South Bend Lathe Works
Stanley Electric Tools
Whitman & Barnes

DRILLING MACHINES, PORTABLE ELECTRIC
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Dixon, Inc., Wm.
Patterson Bros.
Snap-on Tools, Corp.
Stanley Electric Tools

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Walker-Turner Div.

DRILLS
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Snap-on Tools, Corp.
Stanley Electric Tool Div.
Whitman & Barnes

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Atlas Press Co.
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
Duro Metal Products Co.
Patterson Bros.
South Bend Lathe Works
Walker-Turner Co.

DRILLS, BREAST
Brodhead-Garrett Co.
Patterson Bros.
Snap-On Tools Corp.
Stanley Tools

DRILLS, CARVING FOR PLASTICS
Brodhead-Garrett Co.
Foredom Electric Co.
Patterson Bros.

DRILLS, HAND
Dixon, Inc., William
Patterson Bros.
Snap-on Tools, Inc.
Stanley Tools

DUPLICATORS, MIMEOGRAPH
Dick Company, A. B.

DUST COLLECTORS
Craftools, Inc.
Kindt-Collins Co.
Patterson Bros.
School Products Co.

DYNAMOMETERS, ELECTRIC
Brodhead-Garrett Co.

E

ELECTRIC WELDING EQUIPMENT & SUPPLIES
Brodhead-Garrett Co.
Delta Mfg. Co.
Marquette Mfg. Co.
Standard Pressed Steel Co.

ELECTRIC EQUIPMENT, WIRE & SUPPLIES
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Gearon Company, The
Kassel & Co., L. H.
Ohmite Mfg. Co.

ELECTRIC GENERATORS
Standard Electric Time Co.

ELECTRIC MOTORS
Boice-Crane Co.
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Patterson Bros.

ELECTRIC SOLDERING IRONS
Brodhead-Garrett Co.
Dixon, Inc., William
Handcrafters, The
Patterson Bros.
Snap-on Tools, Inc.
Stanley Tools

ELECTRICAL INSTRUMENTS
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Electronic Instrument Co. (EICO)
Weston Electric Instrument Co.

ELECTRICITY — Experimental Kits for Teaching
Electronic Kits Supply Co.
National Adequate Wiring Bureau

ELECTROTYPES
Badger-American Electrotype Co.

ENAMELING ON COPPER SUPPLIES
Copper Shop
Craftools, Inc.
Dixon, Inc., William
School Products Co.

ENGRAVERS' TOOLS AND SUPPLIES
Dixon, Inc., William
Metal Craft Supply Co.
Metal Goods Corp.
Plasticast Co.

ENVELOPES
Western States Envelope Co.

EXPOSURE METERS
Weston Electric Instrument Corp.

F

FEEDERS, AUTOMATIC (Prtg.)
American Type Founders Co., Inc.

FIBERGLAS FABRICS
Castolite Co., The

FILES AND RASPS
Brodhead-Garrett Co.
Dixon, Inc., William
Foley Mfg. Co.
Nicholson File Co.
Patterson Bros.
Simonds Saw & Steel Co.
Snap-on Tools Corp.

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Hamilton Mfg. Co.
Parent Metal Products, Inc.
Weber Co., F.

FILING MACHINES
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Foley Mfg. Co.
Sales Service Machine Tool Co.

FILMS, INDUSTRIAL TRAINING, TEACHING, ETC.
Aluminum Co. of America
Eastman Kodak Co.
Jam Handy Organization
South Bend Lathe Works
Starrett Co., The L. S.
United World Films, Inc.

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General Finishes Sales & Service Co.
Patterson Bros.
Upholstery Supply Co.

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Electric Hotpack Co., Inc.
Plasticast Co.

FIRE CLAY
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CHEMICAL DIVISION
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IT'S GOT TO BE GOOD

SHOP EQUIPMENT NEWS

(Continued from page 94A)

Remote station includes a *press-to-talk* switch. The remote switch can be left in the *talk* position to permit continuous *listening in* by the master station. It also allows operator to call in to master station even though the remote may not be in close proximity. *On* operation of master is indicated by a pilot light. The master station can communicate with remote regardless of the position of switch on the latter. Because only the master station need be connected to a power source, the remote station can be located at any convenient spot.

Kit is supplied complete with all tubes, 50-ft. cable, solder, wire, all parts, easy-to-follow instructions, etc. It operates from 110–120 volts ac or dc. Styling is modern and units are finished in antique white.

For more data write to the manufacturers.

(For Convenience Circle Index Code 0309)

No. 00 AUTOMATIC FORMING AND CUTTING-OFF MACHINE

Two new versions of the Brown & Sharpe No. 00 Automatic Screw Machine are available from Brown & Sharpe Manufacturing Company. They are for the frequent jobs which are advantageously performed without the necessity of reversing the machine spindle. Both machines have the exceptionally high spindle speed of 10,000 r.p.m., realizing tremendously increased efficiency on free-machining materials with a wide range of lower speeds for efficient operation on the tougher alloys.

No. 00 Automatic Forming and Cutting-off Machine

Type 1 has a turret and vertical slide, and is identical with the automatic screw machine except for the nonreversing spindle. It is designed for drilling, reaming, facing, turning, forming, knurling, cutting-off, etc.

Type 2 omits the vertical slide, and the turret is replaced by a one-tool position slide. It can be used on all types of form and cutoff work.

Both machines are of full ½-in. capacity and have all the other time-saving and productive features which have proved so profitable on the No. 00 Automatic Screw Machine.

(For Convenience Circle Index Code 0310)

NEW WELDING TORCH

Air Reduction Sales Company has made available a new welding torch which features a "quick shut-off" valve, for production line, light gauge welding and brazing jobs. It is especially suited for production welding in the refrigeration and automotive industries,

(Continued on page 102A)

Good News from

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MORE ACCURATE . . .

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48"	9.75

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36"	2.25
48"	3.50
60"	4.50

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Dietzgen Co., Eugene
Modern School Supplies
Patterson Bros.
Snap-on Tools Corp.
Weber Co., F.

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DonJer Products
School Products Co.

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Dixon, Inc., William
Johnson Gas Appliance Co.
Kester Solder Co.
Patterson Bros.
Ruby Chemical Co.

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Dietzgen Co., Eugene
Lufkin Rule Co.
Modern School Supplies
Patterson Bros.
Stanley Tools

FORGE TOOLS
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Patterson Bros.
Stanley Tools

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American Gas Furnace Co.
Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.

FORGES, GAS
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Brodhead-Garrett Co.
Dixon, Inc., William
Patterson Bros.
Sunbeam Corp.
Western Material Co.

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Curtis Mfg. Co.
Sterling Wheelbarrow Co.
Tolerton Co.
Western Materials Co.

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Weston Electric Instrument Co.

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Electric Hotpack Co., Inc.
Johnson Gas Appliance Co.
Kindt-Collins Co.
Patterson Bros.
Plasticast Co.
Western Materials Co.

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Standard Pressed Steel Co.

G

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Weston Electric Instrument Co.

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Patterson Bros.
Scherr Co., Inc., Geo.
Stanley Tools

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Dixon, Inc., William
Lufkin Rule Co.
Patterson Bros.
Scherr Co., Inc., Geo.
Starrett Co., L. S.

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Duro Metal Products Co.
Lufkin Rule Co.
Patterson Bros.
Scherr Co., Inc., Geo.
Starrett Co., L. S.

GENERATOR TEST BENCHES
Standard Electric Time Co.
Standard Pressed Steel Co.

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Lufkin Rule Co.
Patterson Bros.

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Higgins Ink Co., Inc.
Kindt-Collins Co.
Patterson Bros.
Paxton Lumber Co., Frank
Plasticast Co.
Rogers Isinglass & Glue Co.

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Brodhead-Garrett Co.
Kindt-Collins Co.
Oliver Machinery Co.
Patterson Bros.
Plasticast Co.

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Brodhead-Garrett Co.
Craftools, Inc.
Delta Mfg. Co.
Dixon, Inc., William
Patterson Bros.
Plasticast Co.
Stanley Electric Tools
Walker-Turner Div.

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Black & Decker Mfg. Co.
Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Corp.
Dixon, Inc., William
Duro Metal Products Co.
Mummert-Dixon Co.
Patterson Bros.
Queen City Machine Tool Co.
Snap-on Tools Corp.
Stanley Electric Tools
Walker-Turner Div.

GRINDERS, OILSTONE
Atlas Press Co.
Brodhead-Garrett Co.
Mummert-Dixon Co.
Oliver Machinery Co.

GRINDERS, TOOL ROOM, SURFACE
Atlas Press Co.
Black & Decker Mfg. Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Milling Machine Co.
Dumore Co., The
South Bend Lathe Works
Stanley Electric Tool Div.

GRINDING MACHINES Plain Universal, Centerless
Atlas Press Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Cincinnati Milling Mach. Co.

GRINDING WHEELS
Atlas Press Co.
Brodhead-Garrett Co.
Cincinnati Milling Machine Co.
DeWalt Products Corp.
Dixon, Inc., William
Duro Metal Products Corp.
Patterson Bros.
Plasticast Co.
Snap-on Tools Corp.
Stanley Electric Tool Div.

H

HACKSAW BLADES
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Dixon, Inc., William
Duro Metal Products Co.
Patterson Bros.
Simonds Saw & Steel Co.
Snap-on Tools Corp.
Starrett Co., The L. S.

HACKSAWS, Portable, Electric, Power
Brodhead-Garrett Co.
Duro Metal Products Co.
Misener Mfg. Corp.
Patterson Bros.
Snap-on Tools Corp.

HAMMERS
Brodhead-Garrett Co.
Cunningham, M. E.
Dixon, Inc., William
Duro Metal Products Co.
Patterson Bros.
Sales Service Machine Tool Co.
Snap-on Tools Corp.
Stanley Tools
Williams Co., J. H.

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Brodhead-Garrett Co.
Stanley Electric Tools

HAND SAWS, PORTABLE ELECTRIC
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Brodhead-Garrett Co.
Patterson Bros.
Stanley Electric Tools

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Brodhead-Garrett Co.
Cincinnati Tool Co.
Patterson Bros.

HANDICRAFT SUPPLIES
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Brodhead-Garrett Co.
Castolite Co., The
Copper Shop
Craftools, Inc.
Craftsman Wood Service Co.
Dixon, Inc., William
Gearon Company, The
General Finishes Sales & Service Co.
Hammett Co., J. L.
Hubbell Metals, Inc.
Metal Goods Corp.
Patterson Bros.
Plasticast Co.
School Products Co.
Webcraft, Inc.

HARDIES
Brodhead-Garrett Co.
Patterson Bros.
Stanley Tools

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Brodhead-Garrett Co.
Weston Electric Instrument Corp.

HEATING ELEMENTS, ELECTRIC
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Electric Hotpack Company, Inc.

HEAT-TREATING EQUIPMENT
American Gas Furnace Co.
Brodhead-Garrett Co.
Electric Hotpack Company, Inc.
Johnson Gas Appliance Co.
Patterson Bros.
Western Materials Co.

I

IMPACT TOOL, Portable Electric
Snap-on Tools Corp.

IMPORTED WOODWORKING TOOLS
Mittermeier, Frank

IMPORTERS' GERMAN DRAWING INSTRUMENTS
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Modern School Supplies

INDICATING INSTRUMENTS, ELECTRIC
Weston Electric Instrument Co.

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Ford Motor Co.

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Dietzgen Co., Eugene
Higgins Ink Co., Inc.
Modern School Supplies
Weber Company, F.

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Brodhead-Garrett Co.
Dietzgen Co., Eugene
Higgins Ink Co., Inc.
Keuffel & Esser
Modern School Supplies
Post Company, Frederick
School Products Co.
Weber Company, F.

INKS, PRINTING
American Type Founders Co., Inc.
Brodhead-Garrett Co.
Driscoll & Co., Martin

J

JEWELERS' TOOLS, EQUIPMENT AND SUPPLIES
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Brodhead-Garrett Co.
Craftools, Inc.
Dixon, Inc., William
Foredom Electric Co.
Patterson Bros.
Plasticast Co.
Wilton Tool Mfg. Co., Inc.

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Brodhead-Garrett Co.
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Dixon, Inc., William
Duro Metal Products Co.
Magna Power Tool Corp.
Oliver Machinery Co.
Patterson Bros.
Walker-Turner Co., Inc.
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Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
DeWalt Products Co.
Duro Metal Products Co.
Kindt-Collins Co.
Magna Power Tool Corp.
Northfield Foundry & Mach. Co.
Oliver Machinery Co.
Patterson Bros.
Walker-Turner Co., Inc.
Yates-American Machine Co.

K

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Plasticast Co.

KILNS
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Copper Shop
Craftools, Inc.
Electric Hotpack Company, Inc.
Plasticast Co.
School Products Co.
Western Materials Co.

KNIVES, PAPER CUTTER
American Type Founders Co., Inc.
Brodhead-Garrett Co.
Simonds Saw & Steel Co.

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Oliver Machinery Co.
Patterson Bros.
Simonds Saw & Steel Co.
Yates-American Machine Co.

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Dixon, Inc., William
Modern School Supplies
Patterson Bros.
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Giles & Kendall

KNURLS
Armstrong Bros. Tool Co.
Brodhead-Garrett Co.
Brown & Sharpe Mfg. Co.
Patterson Bros.
Williams & Co., J. H.

L

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Weston Electric Instrument Co.

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Plasticast Co.

LAMPS, MINIATURE
Brodhead-Garrett Co.

LATEX MOLDING COMPOUNDS
Castolite Co., The
Plasticast Co.
School Products Co.

LATHE ATTACHMENTS
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Atlas Press Co.
Brodhead-Garrett Co.
DeWalt Products Corp.
Duro Metal Products Corp.
Oneida Machine Tool Corp.
Patterson Bros.
Plasticast Co.
Sheldon Machine Co., Inc.
South Bend Lathe Works
Walker-Turner Div.
Williams Co., J. H.

LATHES, Bench, Metal Working
Atlas Press Co.
Boice-Crane Company
Brodhead-Garrett Co.
Columbia Machinery & Supply Co.
Duro Metal Products Co.
LeBlond Machine Tool Co., R. K.
Logan Engineering Co.
Patterson Bros.
Plasticast Co.
Scherr Co., Inc., Geo.
Sheldon Machine Co., Inc.
South Bend Lathe Works

LATHES, GAP BED
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Brodhead-Garrett Co.
Dixon, Inc., William
Duro Metal Products Corp.
LeBlond Machine Tool Co., Inc.
Walker-Turner Co., Inc.

LATHES, SMALL PRECISION
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Brodhead-Garrett Co.
DeWalt Products Corp.
Dixon, Inc., William
Plasticast Co.
South Bend Lathe Works
Sheldon Machine Co., Inc.

LATHES, SPINNING
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Boice-Crane Company
Brodhead-Garrett Co.
Delta Mfg. Co.
Dixon, Inc., William
Oliver Machinery Co.
Patterson Bros.
Plasticast Co.
Sheldon Machine Co., Inc.
Walker-Turner Co., Inc.

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ALBANY 5, NEW YORK

SHOP EQUIPMENT NEWS

(Continued from page 100A)

and other light work where intermittent welding is involved. Known as the Airco Style 600 Shut-Off Torch, it is a well-balanced unit that weighs only 14 ounces and is 7¼ in. long. A complete line of tips, mixers, and extensions are available for use with this torch.

For more information about the outstanding features of the new Airco 500 Torch, write to Air Reduction Sales Company, a division of Air Reduction Company, Inc.

(For Convenience Circle Index Code 0311)

HEAVY-DUTY SAW JOINTER

Rockwell Manufacturing Company's Delta Power Tool Division has introduced a new saw-jointer combination which combines the jointer with a 9-in. tilting arbor saw.

Designed primarily to provide additional capacity for builders, contractors, industrial maintenance work and small commercial shops, the new tools also offer ambitious home workshop owners a shop-capacity tool at home workshop prices.

Heavy-Duty Saw Jointer

The new saw will cut to a depth of 2¾ in., thus enabling the operator to cut *full* 2-in. stock at a 45-deg. tilt.

Other important "firsts" include: a new guarded safety switch, which can be locked; a new raised tilt scale which the operator can easily read without bending over; and new easily accessible controls and a fence that locks both front and rear, with up-front controls.

Designed for use with a full ¾-h.p. motor, the new tool offers all the time-tested features of Rockwell-built Delta saws.

For further information write to the manufacturer.

(For Convenience Circle Index Code 0312)

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(Continued on page 104A)

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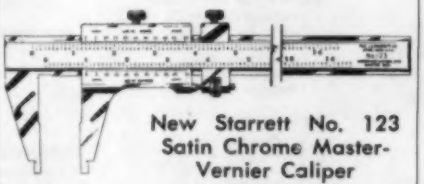
(Continued from page 102A)



New Starrett No. 123 Satin Chrome Master-Vernier Caliper

All reading surfaces of the gauge are finished in Starrett Satin Chrome. Other surfaces are hard chrome plated for resistance to rust and stains.

Other features include: hardened and stabilized master bar for maximum rigidity and resistance to wear; extra long adjusting jaw for greater bearing surface to assure squareness; new jaw design for greater rigidity and resistance to springing; combination straight and angular ways for positive alignment of graduations and easy adjustment of the slides by hand or with the fine-adjusting screw.

For further information write to the manufacturer.

(For Convenience Circle Index Code 0313)

MITER AND CORNER CLAMP NO. 404

Stanley Tools have introduced a new, improved-design miter and corner clamp, No. 404. It is engineered for woodworkers who want the highest caliber of accuracy. It is especially suited for gluing, stapling, and nailing of picture-frame moldings, and also for making screens, trim, and storm windows, requiring accurate 90-deg. angles.

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(Continued on page 106A)

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SHOP EQUIPMENT NEWS

(Continued from page 104A)

mediately available through Pittsburgh Plate's industrial finishes sales division.

(For Convenience Circle Index Code 0315)

THE DI-ACRO BENDER MODELS

O'Neil-Irwin Mfg. Company are the manufacturers of the Di-Acro Bender, which is available in three models. Model 1A has a material capacity of 1/16-in. hot rolled round steel bar, 1/2 in. o.d. steel tubing and 3/16 by 1-in. flat steel bar (bent flat). Radius capacity is 6 in. The No. 1A Bender is a popular bending machine in school shops where wrought iron is being incorporated into projects.

If you intend to get into tubular furniture projects, the Model 2 or 3 Bender is recommended.

Model 2 is large enough to handle the forming of tubular metal furniture and heavier wrought iron materials, but it will also handle small work. Its rugged construction assures continuous day in and day out operation in materials as heavy as 1/2-in. round steel bar, 3/4-in. o.d. steel tubing and 1/4 in. by 1 1/2-in. flat steel bar (bent flat). Radius capacity is 9 in.

Model 3 will be particularly useful in those school shops concentrating upon metalwork involving heavier materials, like larger diameter tubing. Material capacity is 5/8-in. round steel bar, 1-in. o.d. steel tubing and 1/4 by 2-in. flat steel bar (bent flat). Radius capacity is 12 in.

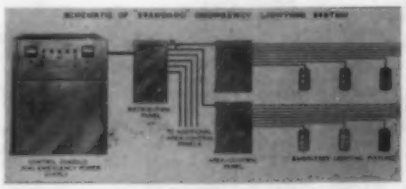
Write for specification sheet on the complete Di-Acro line.

(For Convenience Circle Index Code 0316)

EMERGENCY LIGHTING SYSTEM

The Standard Electric Time Company, pioneers of electrically supervised interior fire alarm systems, have introduced a new centralized emergency lighting system that constantly supervises itself. It has been tested and approved by Underwriters Laboratories. The system, which is designed to provide emergency illumination throughout public and private buildings, also exceeds the requirements of the National Electrical Code.

The new emergency lighting system not only reports, by flashing lights and buzzers, any fault to the system but even sounds an alarm when an emergency lamp is removed from its socket. This built-in supervision makes the system 100 per cent foolproof and gives full assurance that emergency lights will go on whenever regular power fails.



Schematic of Emergency Lighting System — Type 32EL, Series 300

In operation the system is instantaneous and fully automatic. Emergency lights go on the instant regular power fails and go off when power is restored. It has been especially designed for hospitals, schools, office and industrial buildings.

For additional information write to the firm mentioned above.

(For Convenience Circle Index Code 0317)

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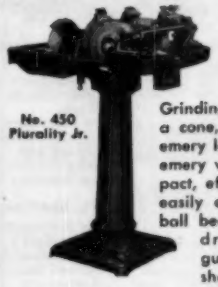

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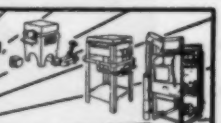

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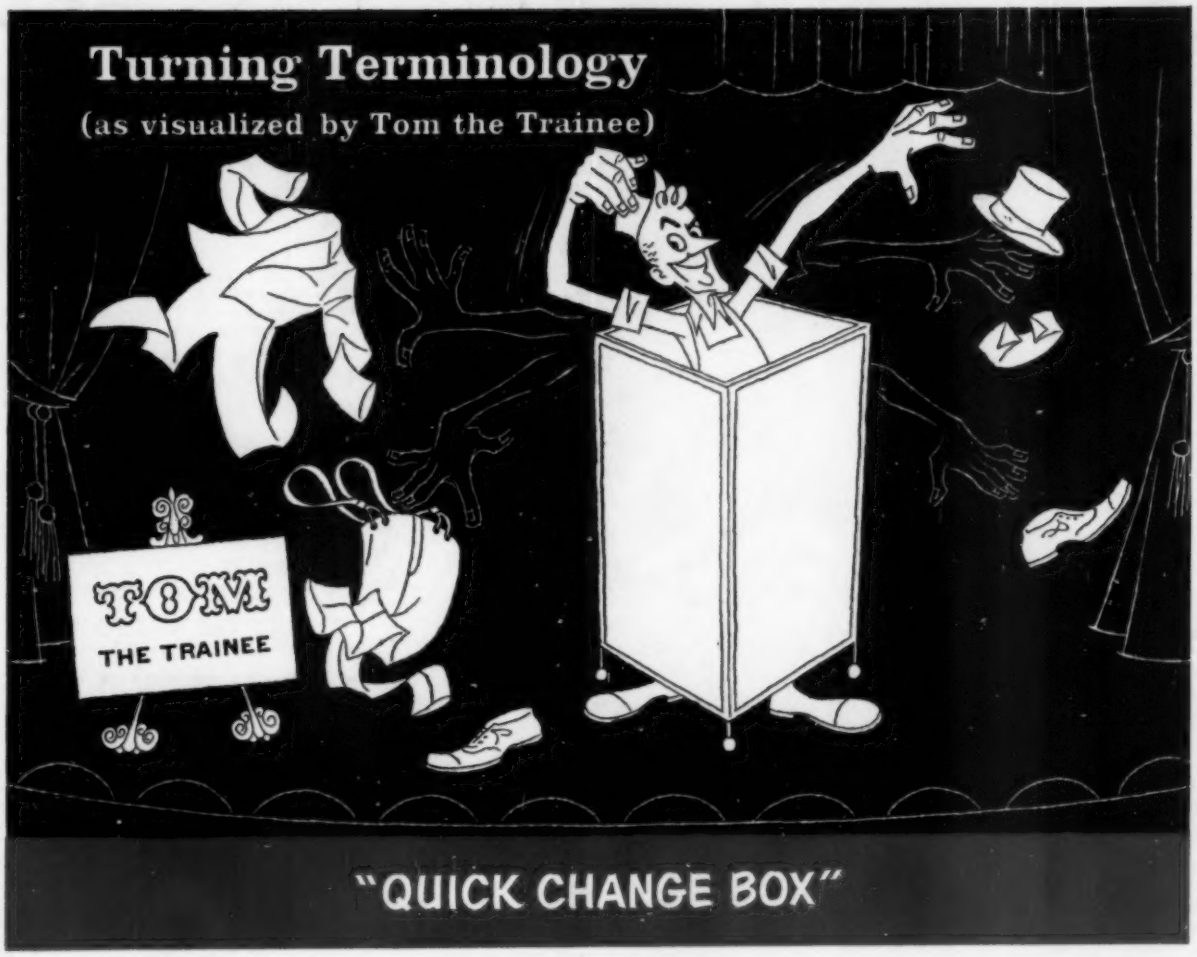

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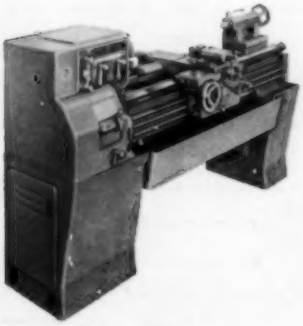

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